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ABSTRACTS

PHYSICAL SCIENCES

WESTERN GUIZHOU'S CAOHAI AREA DESCRIBED

Beijing DILI ZHISHI [KNOWLEDGE OF GEOGRAPHY] in Chinese No 6, Jun 79 p 12

[Article by Yang Junping [2799 0971 1627]: "Caohai (Grass Sea) on Guizhou's Western Plateau"]

[Text] The Wumeng Mountain region of western Guizhou has always been called the western plateau of Guizhou. It is situated at a high elevation, mostly over 2,000 meters above sea level with a highest elevation reaching about 3,000 meters. On this hilly plateau that rises and falls gently there are many seas and green lakes reflecting the blue sky and red flowers, decorating the highland beautifully.

These seas are found in lowlands distributed among the hillocks on the plateau, lowlands between ridges and along the borders of the plateau. Seas along the borders of the plateau include the Yandong Sea, Xiao Sea, Shedi Sea and Xiangbi Sea in the Heishi region. Seas in lowlands between ridges include Qingshuitang, Yejihe Sea and Xiushui Sea in the Guanfeng Sea region. Seas in the lowlands among hillocks include the Xicao Sea of Weiningcheng.

The water of Caohai reaches a total of 380 square kilometers. The sea itself is about 45 square kilometers. Average depth is 2 meters. The sea is the largest in area in Guizhou Province and one at a relatively high elevation. The surface of the lake is wide as a boundless expanse of blue water like a shining mirror.

The county records state the western part of Weining was originally a big plain. Water from the four mountains come together and flow into three rivers that thread through the plain and pour into the Xiaowangmiao near Jiangjiawan at Yangguan and into the several dozen dry caverns of Aohe. In the 27th year of Daoguang of the Manchu Dynasty, pouring rain continued and the water overwhelmed the mountains and rushed down the mountains with sand and stones. All the underground water sanctuaries were blocked up and the plain became submerged under water and a sea was thus formed.

Caohai developed on anticlinal strata in the shape of a ship's hold. The axis points to the northwest-southeast. The axis is composed of chunks of

limestone of light gray and dolomitic limestone of the lower limestone era, marl, shale and silicon rocks. After prolonged erosion and corrosion, the plateau eroded to form a large basin of gentle hillocks. Its elevation from sea level is low. Areas of the banks and beaches of the lakes have an elevation of 2,160 to 2,175 meters above sea level and the relative heights of the hills are all less than 50 meters. The slopes of the ground are all below 15 degrees and gentle mounds rise up. During the early period the low lands gathered water and water and marshes were connected and they covered expansive areas in extremely irregular shapes. The sand that originated from Wumengshan in the east, Xiliangshan in the west and the Dalongcao Liangzihe river continually filled the marshlands as silt. Thus the ancient seas shrank in size and isolated and scattered small marshlands, after the water from the lakes dried up, gradually were reclaimed and cultivated as farmland. The large marshland is today's Caohai.

Because the rainy season in the Weining region is unevenly distributed, there is a clearly defined dry season and a wet season. There is more rain in summer and autumn and the surface of the lakes expands. Some of the lowlands near the lakes or downstream areas where rivers empty into the seas become marshy wet lands resulting from seasonal flooding. These kinds of regions are mainly distributed in the northeastern part of Caohai (west of Weiningcheng) between Liudongqiao and Liujiayuan, extending about 5 kilometers. The widest point is 800 meters across with an area of 2 square kilometers. The plains near the lakes are not uniform in width and are discontinuously distributed. They are between 10 and 15 meters above the lake surfaces. The ground is level. The soil layer is deep and thick. The soil is fertile and plenty of corn, potatoes, soybean and beets are produced.

In the morning, climbing up to the sea view pagoda outside of town, looking over Caohai and seeing the calm waves, the scenery is very beautiful. In winter, flocks of wild ducks rest on the beaches. They mingle with the wild geese which have returned from the north and the water fowl and egrets. It is another scene.

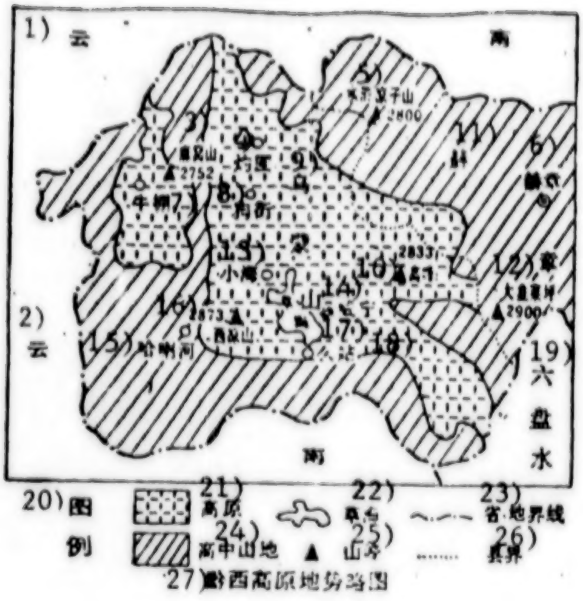
The seas also produce various kinds of fish. Xi yu is a famous specialty of Caohai. Every summer, xi yu of about one cun in length swarm to the shallow beaches of the seas and it is the golden season for catching them. Other kinds of fish such as the carp and white zucco platypus, and hebao fish are also plentiful.

Caohai is also famous for its many varieties of aquatic plants. Because of the massive growth of herbs, organic matter has continuously been accumulated and deposited in spaces in the soil. The remnants of these plants do not decompose completely when submerged in water but pile up to form a grassy charcoal layer. The grassy charcoal layer of Caohai is generally several dozen centimeters thick and the thickest can reach over 1 meter. Because the western Guizhou plateau's new tectonic movements rose upward violently, Caohai sank to a larger degree. The accumulation of mud and sand was faster than the growth of grasses. Thus above the grassy charcoal layer there is a layer of accumulation from several dozen centimeters to

one meter thick from rivers and lakes. Therefore the peat at this locality belongs to buried peat. The peat contains large amounts of organic matter and a lot of nitrogen, phosphorus and potassium nutrients, and the content of humic acid is especially plentiful. Therefore the peat at this locality is a natural treasury of fertilizers.

In 1970, due to interference and sabotage by Lin Biao and the "gang of four," Caohai was blindly furrowed and drained and the water surface of Caohai shrank greatly. But the topography here is low and marshy. During the rainy season, runoff comes together and the water in the lakes cannot be easily drained dry. Therefore the reclamation rate along the lakes is very low. Soil resources could not be fully utilized. The resources of aquatic animals and plants also suffered great loss. To protect the natural environment, to be able to reasonably utilize natural resources, the water surface of Caohai must be restored, so that this natural blue treasure can develop a greater function in socialist construction.

[Map on following page]



1	Yunnan
2	Yunnan
3	Mawoshan
4	Zhupu
5	Shuihuliangzishan
6	Hezhang
7	Niupeng
8	Goujie
9	Wumengshan
10	Gaofeng
11	Hezhang
12	Dajiucaiping
13	Xiaohai
14	Weining
15	Halahe
16	Xiliangshan
17	Caohai
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ADVANCES IN ATMOSPHERIC REMOTE SENSING RESEARCH REPORTED

Beijing DAQI KEXUE in Chinese Vol 3, No 3, Sep 79 pp 203-208

[Article by Zhou Xiuji [0719 4423 7535], Institute of Atmospheric Physics, Chinese Academy of Sciences; manuscript received 28 April 1979: "Advances in Atmospheric Remote Sensing Research"]

[Text] Atmospheric remote sensing is a new method of atmospheric measurement which was comprehensively developed during the 1960's. Its development will provide richer and more profound observational data for the understanding of atmospheric movements and the laws of atmospheric changes, in addition to serving as an important tool for advancing progress in atmospheric research. Back in the middle 1960's, the problem of how to quickly employ modern space, laser, infrared and microwave technology in our country's atmospheric science research, to develop new atmospheric detection systems and to adapt meteorology to the modernization and construction of our country's defenses and people's livelihood, and how to advance our country's atmospheric sciences so as to overtake and surpass the world state of the art, attracted the close attention of illustrious earth physicist Zhao Jiuzhang [6392 0046 4545] and meteorologist Gu Zhenchao [7357 7201 3390], so that they began to organize a force and to develop a research program for the development of atmospheric remote sensing. Between 1965 and the present, under the leadership of the party we have striven to deal with and have overcome various types of interference and difficulties and have comprehensively developed research work in the important fields of laser, infrared, acoustic and microwave atmospheric remote sensing, gradually forming an atmospheric remote sensing research cadre, and have achieved a number of successes in scientific research. This article is mainly a comprehensive introduction to the development of research work in laser, infrared and microwave remote sensing; for information on acoustic remote sensing and radar measurement please see other articles in this issue, since these subjects will not be discussed here.

1. Laser Atmospheric Remote Sensing

At the end of 1976, with energetic assistance from the Shanghai Laser Institute, CAS, our institute developed this country's first large-size ruby

laser meteorological radar (see Fig. 1). [not reproduced] Its radiative power reached 1 joule, the pulse width was 25 nanoseconds, the repetition rate was 5 pulses per second, the receiving aperture was 100 mm, and the capabilities were roughly equivalent to those of United States meteorological optical radars of the same period. Afterwards we did some fairly systematic theoretical research in laser physics dealing with chromium ion concentration in ruby and laser output efficiency, and yinhuajing [7148 5363 5464] dye Q-switching stability[1-3]. On the basis of this we increased the output efficiency of our ruby laser by a factor of 4. With output power maintained basically unchanged, we decreased the volume of the working material to slightly more than an eighth, thus producing a high power, small size laser meteorological radar suitable for field mobile observations (see Fig. 2). [not reproduced] For many years these two laser meteorological radar observation systems have been used by us in comprehensive work dealing with the altitude and thickness of clouds, the optical characteristics and the level and slant visibility of the lower atmosphere, and the diffusion of atmospheric pollution.

At first we used the laser cloud height determination and a two-coordinate base line method of determining the height at which a balloon entered the clouds as comparison observations[4], which thoroughly confirmed the reliability and superiority of the laser cloud measurements. As regards the extinction coefficient of the lower layers of the atmosphere, in the Peking area we made more than 3 years of systematic laser measurements[5]. In 1975, we also combined this with an observation of atmospheric transmissivity in the visible solar spectrum[6]. The results of these investigations indicated that the physical structure of the lower atmosphere below 3 km had an extremely important place in determining the optical characteristics of the entire layer. Under most conditions, the Elterman atmospheric visibility coefficient, which is regularly used abroad, is not applicable to the lower layers of the atmosphere. Using only the horizontal visibility at the surface as the criterion for the optical characteristics of the lower atmospheric layers is insufficient, and account should also be taken of the temperature stratification of atmospheric layers near the surface. In addition, because the laser meteorological radar offers the possibility of conducting almost continuous observation of the distribution of the atmospheric extinction coefficient, we obtained observational data on the fluctuations and wave movement of this coefficient and conducted some initial fundamental experiments on the spatial and temporal structure coefficients of the fluctuation of the atmospheric extinction coefficient[7], the results of which make it clear that by means of laser observations of it we are able to analyze information on the structure of atmospheric wave motion and turbulence.

Laser radar observation of atmospheric horizontal and slant visibility is of great practical importance. Accordingly, we conducted research on it. After a comparative analysis of 3 years' laser and visual observations of visibility, we proved that the visibility coefficient σ_0 determined by means of the ruby laser meteorological radar were in good agreement with visual determinations of the horizontal visibility[8], generally satisfying the formula

$$R\ (km) = \frac{3.4}{\sigma_o\ (km^{-1})}$$

Observation of slant visibility is somewhat more complex. We developed a specific program for laser measurement of slant visibility and in 1977, using comparisons with observations of slant visibility by airfield personnel and fliers, we carried out preliminary fundamental experiments[9]. The results indicated that the coefficient of correlation between slant visibility values determined by laser weather radar and those determined visually by flight personnel was 0.89. This experimentation will continue.

It is worth pointing out that when the horizontal visibility is less than 1 kilometer, observation indicates that we must also take account of the effect of secondary atmospheric scattering on the reflected radar wave. Accordingly, we derived an optical radar formula which takes account of this effect and proposed a theory[10] of laser observation at low visibilities.

Since 1[illegible] we have used laser weather radar for observation of the density of manmade smoke masses and the diffusion of atmospheric pollution. Under laboratory conditions we obtained results determining the relationship between the strength of the returning laser beam and the density of manmade smoke which proved that we could rapidly and reliably determine the particle density of manmade smoke ranging from 10^1 to 10^7 per cubic centimeter[11]. We have used this laser smoke determination method for some years and have made gains in studying the laws governing the diffusion of atmospheric smoke pollution in mountainous regions.[12]

In the investigation of the laws governing diffusion of pollutants emitted in factory areas too, we have proposed a practical and effective new method for determining the relative spatial density distribution of natural smoke plumes and the diffusion coefficient of pollutants[13,14]. On the basis of this method, for any smoke particle type and any stable refractive index and particle spectrum distribution we can use the returning wave to analyze the relative density distribution of the smoke plume and the diffusion coefficient. Finally, we have made preliminary research into laser measurement of smoke and dust accumulation layers.[15]

Currently, in order to stimulate development of laser atmospheric remote sensing, we must develop a new model laser atmospheric radar and solve the technology for automating the processing of the returning signal; another current task is that of expanding the utilization of laser atmospheric remote sensing in atmospheric science.

2. Infrared Atmospheric Remote Sensing

Infrared atmospheric remote sensing is the method of meteorological satellite observation which recently has been in most extensive use. Since 1970 we have systematically pursued theoretical and practical investigations of

infrared atmospheric sensing. First, as a basis for it, we worked on the theory of the atmospheric infrared spectrum and did computational studies on atmospheric transmissivity[16,17,18]. First, in calculating the transmissivity of atmospheric CO_2, we used the Elsasser model to make corrections for weak spectral line absorption and Q-branch line absorption, and compiled a complete table of functions. Then, on the basis of the latest structural data on absorption lines, we used a precise line-by-line computation method to obtain calculated high-resolution (0.1 cm^{-1}) atmospheric transmissivity figures for the 15-micron CO_2 absorption band.[19]

In the area of theory of atmospheric IR remote sensing observation, we systematically and rigorously discussed two classical problems, air temperature sensing and atmospheric component sensing, and problems of the suitability of the remote sensing formulas corresponding to the frequency-spectrum and scanning methods[20,21]. We first proved the existence and uniqueness of the solution of the remote-sensing formula for scanning method and its stability to observation error. This is of great theoretical importance to remote sensor observation from satellites of atmospheric components such as ozone in the stratosphere. Next, once theoretical research on methods of channel selection and inversion for the frequency spectrum method infrared remote sensing of atmospheric temperatures was in a relatively complete and profound state, we proposed a nonlinear iterative inversion method whose results are an advance over those from the Chahine inversion method. Of course, because we still lack satellite and actual observational data, we can only combine this country's atmospheric observation data from Peking, Shanghai, Canton and other areas for numerical experiments in inversion[18, 22] and use these numerical tests to select some channels which are suited to satellite remote sensing of atmospheric temperature profiles. These channels are typically few in number--only 4 to 6. At the same time, their width is relatively great, with three of them having a width of 5 cm^{-1} and one having a width of 20 cm^{-1}. The advantage of these is they are convenient for technical realization, and the inversion results from the numerical experiment are not worse than the current level.

In our research on atmospheric water vapor profiles, we pointed out its fundamental difference from temperature profile sensing[20, 23], namely that in a uniform-temperature atmosphere it is impossible to use infrared remote sensing to determine the water vapor content. In addition, by seeking a stepwise variation, we introduced the concept of "optimum information layer." Analysis based on this concept shows that in the presence of infrared radiation from the ground, if we rely solely on satellite infrared remote sensing we cannot provide information on the water vapor content of the stratosphere. Accordingly, an attempt to select the most transparent infrared channel for measurement of the lower atmosphere's water vapor by means of an "effective radiation layer" similar to that used in atmospheric temperature distribution sensing would not achieve its objective. The concept of the "optimal information layer" provides a correct route to selection of a measurement channel for total water

vapor content and vertical distribution by infrared sensing, and on this basis we provided some inversion methods and numerical experiment results for water vapor distribution[18].

With the rapid development and extensive utilization of such space technology as meteorological satellites, ocean satellites, resource satellites and spy satellites, foreign interest has been increasingly directed to investigating the transmittance of the large IR window at 8-13 microns. Since 1972, theoretical and practical analysis of the theoretical mechanism of atmospheric attenuating of the IR window and actual atmospheric attenuation coefficients has become an important topic for us. In the plains area near Peking and in the plateau areas of Lhasa and Kampala, with altitudes of 3,700 and 5,500 meters respectively, we have carried out several years' observation and analysis of atmospheric transmittance of the visible and IR spectra[24, 25]. The observational instruments used have included an interference filter plate and solar radiation spectrophotometer, a monochromator and an infrared spectrophotometer. To summarize our observational results, near Peking even on clear days with a surface horizontal visibility up to 30 km, in the 8-13 micron IR window the overall atmospheric vertical transmissivity averages from 0.73 to 0.80 depending on the frequency. In Lhasa, 3,700 meters above sea level, in the same IR region, the overall atmospheric vertical transmissivity averages between 0.75 and 0.87 only. An analysis of observational results together with theoretical calculations allows us to make the preliminary assertion that absorption by aerosol particles and water vapor in the atmosphere, as well as the dimer of water, all are important factors leading to atmospheric attenuation of the IR window. We hypothesized a "pseudolinear open hydrogen bond structural model" for the dimerized water molecule, and using a semiempirical method we calculated the absorption line parameters for a rotational-vibrational band as well as its absorption coefficient in the 550-750 cm^{-1} range[26]. The calculation results were closer to experimental figures than previously. Currently, we are conducting a more profound theoretical analysis of the attenuating effect of aerosol particles in the air.

In order to meet the full range of practical needs, we utilized the existing optical model of the IR window and systematically compiled transfer figures for atmospheric transmissivity[27]. At the same time, in close cooperation with the Tianjin Institute of Maritime Instruments, State Maritime Office, we also carried out aircraft observation experiments using infrared recording remote sensing of the sea surface temperature and proposed a method for correcting atmospheric attenuation by means of the atmospheric radiation transfer formula, achieving relatively satisfactory results[28]. These results will be further extended in applications to correction for atmospheric attenuation in satellite remote sensing of the sea surface temperature.

In order to stimulate the development of our research on infrared atmospheric remote sensing, we will also need both to find a satisfactory

method of employing the actual observation data from meteorological satellites and to strengthen our field observation experiments and our laboratory research on atmospheric optical simulations, so as to secure better agreement between theory and experiment.

3. Microwave Atmospheric Remote Sensing

In the last 10 years, this country's microwave atmospheric remote sensing research has undergone considerable development. Because the Model 711 3-centimeter microwave radar unit has already been made available to weather stations in the various provinces and the 5-centimeter microwave radar unit is now being installed in meteorological departments, radar meteorological research has already gained currency on a broad scale. The Meteorology Department of Nanking University has provided a quantitative analysis of the practical value of the 711 radar in determining precipitation for rainstorms of different intensity.[29] The Central Institute of Meteorology has carried out comparative experiments concerning the rain-determining capabilities of the 3-centimeter and 5-centimeter microwave radars. In addition, a comparison of the results with those from raindrop spectrum observations have found a relatively stable average relationship between the power of the reflected radar wave and precipitation intensity in Peking, Hunan and other areas[30]. On the basic theoretical side, the work of the Peking University Department of Astrophysics on correlation of signal variations in the reflected wave and spectral structure are attracting attention. These results indicate that on the basis of a statistical analysis of the reflected radar signal it is possible to obtain information on the important parameters of cloud and precipitation drop spectra, air circulation and turbulence[31]. Our institute's radar group has calculated the backscatter cross section, attenuation cross section and absorption cross section of spherical raindrops and hailstones at five different wavelengths: 0.86, 3.2, 5.6, 10.7 and 17.6 cm, providing basic data for practical use.[32]

In addition to investigating active microwave radar observation, in 1972 the Peking University Earth Physics Department, the Shanghai Meteorological Instruments Plant and the Peking Plant No 768 cooperated in developing this country's first 5-millimeter single-channel microwave radiometer[33], and used the scan method to obtain observational results on the atmospheric temperature stratification of clear sky below 10 km; below 5 km the mean square error was 2-3° K, while the error above 5 km was somewhat larger. Currently, remote sensing of atmospheric temperature stratification below cloud level has undergone new development. Subsequently our institute has also pursued research on remote sensing of precipitation by microve radiometer. On the basis of raindrop spectrum data from Peking, Tianshan [1131 1472] (Xinjiang) and Lushan [4151 1472], we systematically reduced and calculated the microwave radiation characteristics of precipitation and showed that the relationship between the microwave radiation strength of the precipitation and its intensity was only very slightly dependent on the shape of the raindrop spectrum and was much more stable than the relationship between the intensity of the reflected

wave and the intensity of the precipitation. On the basis of this principle, in 1976 we developed a 3.2-cm microwave radiometer (See Fig. 3) [not reproduced], and carried out observation and analysis of the microwave radiation of precipitation. An experimental comparison of the results with actual rain intensity observations of the rain measuring network in Peking region gave preliminary conformation that use of the microwave radiometer for sensing of areal precipitation quantities within 100 kilometers is both feasible and effective[34]. At present, development and trial production of a microwave radar-radiometer observation complex[35] and technical system is under way, and it is predicted that it will be an effective way of obtaining quantitative data on the water content of clouds and rainfall intensity distribution.

We have also conducted systematic theoretical studies[36-37] in satellite-borne microwave atmospheric remote sensing. Because we have introduced the concept of the spatial wave filter, we have achieved a more profound understanding of the physical nature of the instability of the inversion solution of the atmospheric remote sensing equation and the relationship between the remote sensing formula error and nuclear coefficient on the one hand and the spatial resolution of the inversion solution on the other. On the basis of this theoretical analysis, we have proposed a relatively stable optimal inversion method. This method is relatively successful when used in numerical investigations of microwave remote sensing of the atmospheric temperature distribution. Initially, we selected 8 optimalized channels for 5-mm absorption band satellite remote sensing of the atmospheric temperature distribution. The numerical investigations indicated that they were effective in sensing the atmospheric temperature distribution from the ground surface up to 20 km. Later, we decreased the number of channels to 5, and numerical investigations also gave good inversion results[38]. In particular, we showed that the optimal nuclear formula had almost no connection with the ground surface radiation characteristics, and the selected group of channels could be used above all kinds of ground surfaces for sensing of the atmospheric temperature distribution.

Satellite microwave sensing of the atmospheric water vapor distribution is a relatively difficult problem which has not been fully solved. We have made a preliminary theoretical analysis of it[39]. Currently we are testing some measurement principles and inversion methods which we have proposed. In addition, we have also obtained some preliminary theoretical results related to using atmospheric microwave radiation variation statistical characteristics for sensing of atmospheric temperature structure coefficients and vertical distribution of winds[39].

The above introduction summarizes some of the major developments in this country's investigation of atmospheric remote sensing in the last 10 or so years. We have indeed obtained a good many results, but we must admit that there is a considerable gap between us and the worldwide state of the art. In particular, there are still some spaces that need to be filled. For example, in remote sensing and measurement of the synamic

parameters of atmospheric winds and turbulence, considerable progress has been made abroad, but the problem is still quite important. However, in our research using the photoluminescent effect for remote sensing determination of the atmospheric retractive-index structural constant and the vertical distribution of winds, we have proposed a more effective measurement principle and have obtained successful results in numerical studies[40]. Subsequently we will extend this method to spherical surface wave conditions and we have proposed a laser fluorescence wind determination hypothesis[41]. But as we are limited to domestic technical conditions, we have not yet been able to carry out observational experimental verification. Accordingly, in order for our country's atmospheric remote sensing research to expand on a larger scale and faster in the future, we must make an extremely great effort. In particular, we must take some effective steps to strengthen our use of various kinds of new technology to better our atmospheric remote sensing research and to improve our current extremely weak situation as regards observational experiments, so that our country's atmospheric remote sensing research, based on an intimate combination of theoretical and practical work, will become more solid and make more rapid progress.

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INFLUENCE OF SEA SURFACE TEMPERATURE ANOMALIES ON WEATHER PROCESSES

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[Article by Li Maicun [2621 7796 2625], Chen Lieting [7115 3525 1656] and Lin Xuechun [2651 1331 2797], Institute of Atmospheric Physics, Chinese Academy of Sciences; manuscript received 15 May 1979: "Advances in Research on the Influence of Sea Surface Temperature Anomalies on Long-Range Temperature Processes"]

[Text] 1. Introduction

As everyone knows, the movement of the earth's atmosphere is extensively affected by the substratum, and in particular heating effects of the substratum have an important effect on large-scale atmospheric movements. Because oceans occupy 70 percent of the total surface of the globe, the oceans are the most important component of the substratum of atmospheric movements and they are capable of exerting a controlling effect on them. At the same time, the oceans have a relatively great thermal inertia, with a heat capacity more than 1,200 times that of the atmosphere, and accordingly the oceans are a mechanism for storing heat for the atmosphere. With regard to long-term weather processes, this thermal inertia can moderate rapid changes in the atmosphere, produce stable long-term heating of the atmosphere, cause the atmosphere to continue developing stably in one direction, and produce weather processes on a relatively long time scale. Thus, because heating by the ocean produces a hysteresis effect in the atmosphere, ocean heating anomalies can be expected to be an important factor in the formation of long-term weather processes. In dynamic terms, because the flow rate of the oceans is extremely slow, with a characteristic speed of approximately $U_0 \sim 20$ cm/sec, which is 1/50 the characteristic speed of atmospheric movements, the ocean-atmosphere coupling system's time scale will be:

$$\dot{T} \sim \frac{L}{U_0} \sim \frac{10^7 \text{m}}{U_0} \sim \frac{10^7 \text{m}}{0.2 \text{ m/s}} \sim \frac{10^8}{2} \sim 5 \times 10^7 \text{sec}$$

This is the time scale for long-term weather processes. Accordingly, the results of the interaction between ocean and atmosphere and the effects of the oceans on long-term weather processes are even more far-reaching.

The oceans are an energy source for long-term weather process anomalies. Accordingly, since the 60's, meteorologists have carried out extensive research on the ocean-atmosphere relationship. The work of Nemias[1] and Bjerknes[2] has argued rather forcibly for the existence of such a relationship on the basis of extensive data and physical considerations and has caused the long-standing field of research into ocean-atmosphere relationships to take a great step forward. In recent years, such work has been relatively actively pursued both in this country and abroad, so that it has developed into a profound and extensive branch of weather dynamics.

Of course, the atmosphere and the oceans are two different continuous media which are closely interconnected, whose motions influence each other and restrain each other, and on the one hand as we have stated above, oceanic heating of the atmosphere affects atmospheric movements, while on the other atmospheric movements affect ocean currents by means of shear stresses, so that wind-blown currents are produced in the ocean water, it wells up, and the ocean temperature distribution is changed, with the result that the oceans' atmospheric heating effect is altered. Thus the ocean exerts a thermodynamic effect on the atmosphere and the atmosphere exerts a dynamic influence on the ocean. This interconnection and mutual influence causes the ocean-atmosphere interaction to present a complex picture; recognition of the complexity of the interaction is one of the great recent advances in ocean-atmosphere interaction research. Not long ago, meteorologists still only understood the major heating effects of the ocean on the atmosphere and only a few of them perceived that atmospheric dynamic processes exerted an important effect on the ocean temperature distribution. In recent years a series of investigations have made clear the existence of this relationship; there are still, of course, many disagreements among meteorologists on this point, and this article aims at giving a comprehensive account of results in this country and abroad on this problem and at expounding our own views.

2. Some Facts About the Relationship Between Ocean Temperature and Atmospheric Circulation

The ocean surface temperature (hereafter simply called the "ocean temperature") of the north Pacific has a clearly marked zonal distribution, even more clearly marked than that of the air temperature. But owing to the effect of ocean currents, south of 40° N latitude the ocean temperature in the western Pacific is higher than that in the eastern Pacific year-round, with the difference amounting to about 10° C in summer and 7-8° C in winter; north of 40° N the ocean temperature is higher in the east than in the west, with the difference reaching about 6° C, while the average temperature gradient is greater in the west than in the east. This distribution of ocean temperature results in clearly marked differences in atmospheric circulation over the eastern and western parts of the Pacific: the meridional circulation is stronger in the west than in the east[3]; the temperature of the Pacific has two maximum-gradient

zones at 35-45° and 25-30° N, the ocean front regions, just below two jet streams; and the ocean front regions and the upper-air jet streams correspond in their seasonal changes[4]. Above the equator, the ocean temperature is lower in the east than in the west, with the difference determined primarily by the value in the east[5]; the eastern section is the area of tropical ocean which has the greatest temperature changes[6]. Owing to this thermodynamic structure, there is a direct east-west circulation reflected in the atmospheric zonal direction--the Walker [WOKE 3087 0344] circulation[2].

The period from February to August is a time of increase in the average ocean temperature, with the maximum increase coming in July near 40° N; the period between September and January is a time of falling temperature, with the maximum drop coming in November near 45° N. The passages from the center of maximum increase to the center of maximum decrease and that from the center of maximum decrease to the center of maximum increase are not symmetrical. The former change is abrupt, with a high isoline density; while the latter is gradual, and the month-to-month changes in atmospheric thickness between 1000 and 500 mbar in any one place are very similar. The maximum increase in thickness is in May and the maximum decrease in October, and on the basis of month-to-month temperature changes for the northern Pacific we can see that the maximum temperature change center corresponds to the center of maximum change in the 500 millibar altitude.[7]

Accordingly, in terms of average state, the thermal regime and atmospheric circulation regime are in agreement.

Both the northern Pacific and the north Atlantic have relatively simple temperature departure distributions, and temperature distributions with the same sign [has] consistently accounted for 1/3-1/2 of the ocean surface[9]. Anomalous temperatures in the Pacific can generally be classed into two large categories and four types[10], namely the warm-north, cold-south category, which can be subdivided into the zonal warm-north, cold-south type and the meridional-central warm zone types; and the cold-north, warm south category, which can be subdivided into the zonal cold-north, warm-south type and the meridional-central cold zone type. Between January 1949 and December 1962, 149 out of 168 months, or about 90 percent, fell into these four types; and on 700 mbar and 500 mbar contour maps these sea temperature types follow definite patterns: above a positive ocean temperature departure area there is generally a positive altitude departure; above a negative temperature departure there is generally a negative altitude departure. The various sea temperature types generally set in in the autumn and winter and may persist into the summer of the next year. Their duration is from 3 to 23 months, with an average of about three seasons. The persistence of sea temperature departures is of great importance for long-term weather forecasting, since it is generally both an indicator and a causative factor of anomalous development of the long-term weather process. It has given us the possibility of forecasting subsequent circulation and precipitation on the basis of ocean temperature departures in the previous winter.

Temperature anomalies on the northern Pacific and East Asian atmospheric circulation are closely connected, and the two major sea-temperature departure categories in winter are connected with circulation in East Asia during the summer[11]. When the winter ocean temperature is in the warm-north, cold-south category, it causes the East Asian zonal circulation index to increase in the summer, and when the sea temperature is in the cold-north, warm-south category, this causes the zonal circulation index to decrease and the meridional circulation index to increase. When the ocean temperature departure in summer is in the warm-north, cold-south category, there is generally a particularly large number of typhoons, while when the ocean temperature departure is in the cold-north, warm-south category, typhoons are relatively few[12]. An area of lowered sea temperature appears behind the western Pacific 700 mbar trough, and an area of raised temperature in front of it; the area controlled by the subtropical high has primarily higher temperatures[13]. The strength of the subtropical high is positively correlated with the temperature of the equatorial eastern Pacific[14]; further analysis[15] indicates that the total heat anomaly of the Kuroshio region in January-April is correlated with the ebb and flow of the subtropical high in May, while the eastward extension of the subtropical high in June is relatively well correlated with heat anomalies of the Kuroshio region in May.

Sea temperature anomalies in the north Atlantic are related to blocking activity in Western Europe. Namias[1] analyzed persistent blocking activity in the upper atmosphere over northern Europe, pointing out that it was related to meridional gradients of persistent ocean temperature departures in the Atlantic. Ratcliffe et al[9] discovered that when the temperature of the Gulf Stream was especially low, the next month was favorable for the appearance of blocking in Western Europe, while on the other hand it was advantageous to the appearance of zonal circulation.

Recently there also have been some studies of the common effect of the north Pacific and North Atlantic sea temperature anomalies on atmospheric circulation. An analysis of global atmospheric anomalies in 1972[16] discovered that in that year atmospheric circulation and atmospheric anomalies were closely connected with evident long-term cooling of the two largest warm currents in the Atlantic and Pacific, the Gulf Stream and the Kuroshio. Large-scale dryness or wetness in June in our country is connected with the situation with regard to 500-millibar blocking in the previous period in the two large oceans, while the extent of the blocking situations is related to the meridional sea temperature gradient in the region in question[17]. It can be seen from Figs. 1 and 2 that when the February 500-millibar blocking situation develops in the Atlantic-European area, the meridional gradient of the Atlantic sea temperature departure in January is negative and the meridional gradient for the Pacific is negative, then in June this country has widespread heavy rain; in contrast, when zonal circulation (low blocking index) develops, the meridional gradient of sea temperature for the Atlantic in January is negative, the meridional gradient of sea temperature departure in the Pacific is positive, and in June

this country has extensive dry weather. The results of abnormal heating of the atmosphere by the anomalous temperature of the two oceans can also be seen from the chart: in the 500-mbar medium and high latitude zone a blocking system with a wavelength of 6,000-7,000 km is formed.

Figure 1. Average deviation of 500 mbar altitude in February (solid lines; interval 20 meters; heavy line is zero level) and average deviation of sea temperature in January (dotted lines; interval 0.2° C; cross-hatching indicates value above +0.2° C; slant-lining indicates values below -0.2° C), with high Atlantic blocking index.

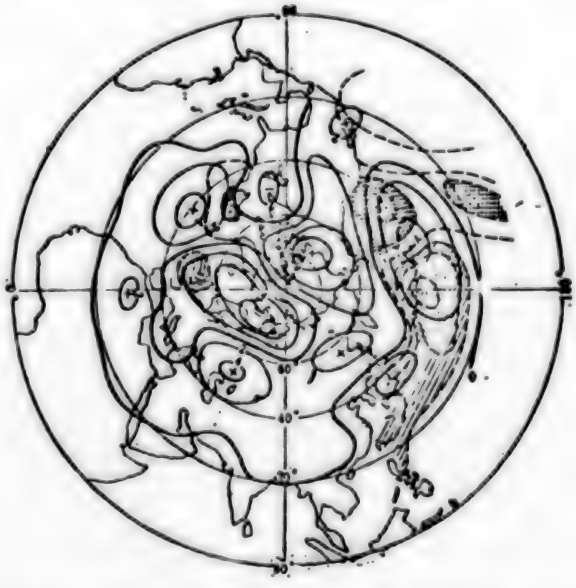

Figure 2. Average deviation of 500 mbar altitude in February and ocean temperature deviation in January with low Atlantic blocking index (see Fig. 1 for explanation).

The tropical zone is the main source of energy for atmospheric motion and of water vapor, and the tropical ocean zone is an important area affecting our country's weather and climate. Fu Congbin [4569 3222 2430] et al[18] calculated the average meridional circulation and the average zonal circulation near the equator for the Atlantic area in December 1972, a month in which the temperature increase for the eastern Atlantic was greatest. They pointed out that when the temperature of the equatorial Pacific is anomalously high, the average zonal circulation in the upper atmosphere is relatively weak at the same time period and cannot form a closed zonal vertical cell, while the average meridional vertical circulation is relatively extensive and there is a strong Hadley circulation in both the northern and southern hemispheres; when the sea temperature of the equatorial east Atlantic was anomalously low, the average zonal vertical circulation in the upper atmosphere for the same period was extensive, subsidence in the east and rising in the west produced a completely closed circulation path, and the average meridional circulation is not extensive, the Hadley circulation in the northern and southern hemispheres disappears, being replaced by equatorial circulation.

When he analyzed the relationship between the water temperature in the equatorial part of the Pacific and precipitation in this country, Chen Lieting [7115 3525 1656][6] devoted attention to the interaction that exists between the Walker circulation and meridional circulation, and proposed a possible mechanism for the influence of ocean temperature in the equatorial Pacific on our country's precipitation: when the spring sea temperature in the equatorial part of the eastern Pacific is on the high side, as the equatorial cold tongue shrinks eastward, the June Walker circulation moves east, the size of the area with an ascending movement expands eastward, and the anti-Walker current in the equatorial Pacific extends, causing the western Pacific tropical area's monsoon circulation to expand; the north Pacific Hadley circulation weakens and moves northward, with its center near 18° N, and accordingly the subtropical ridge in the west Pacific retreats eastward, weakens and moves northward, the Yangtze-Huai basin has little rain (Fig. 3-4); when the spring water temperature in the equatorial region of the eastern Pacific is relatively high, the subsidence movement expands westward, the equatorial dry belt expands, the Walker circulation shifts east, the western Pacific tropical monsoon circulation weakens, the Hadley circulation increases markedly and moves south with its center near 12° N, and the western Pacific subtropical ridge extends eastward, strengthens and moves toward the south, producing considerable rain in the Yangtze-Huai basin.

Moreover, Yang Jianchu [2799 7003 0443][19] has also discovered that there is a clear connection between solar activity and the ocean temperature in the low and middle latitudes of the eastern Pacific east of 150° E; he proposes that the solar activity affects atmospheric circulation by affecting the sea temperature which affects these key areas.

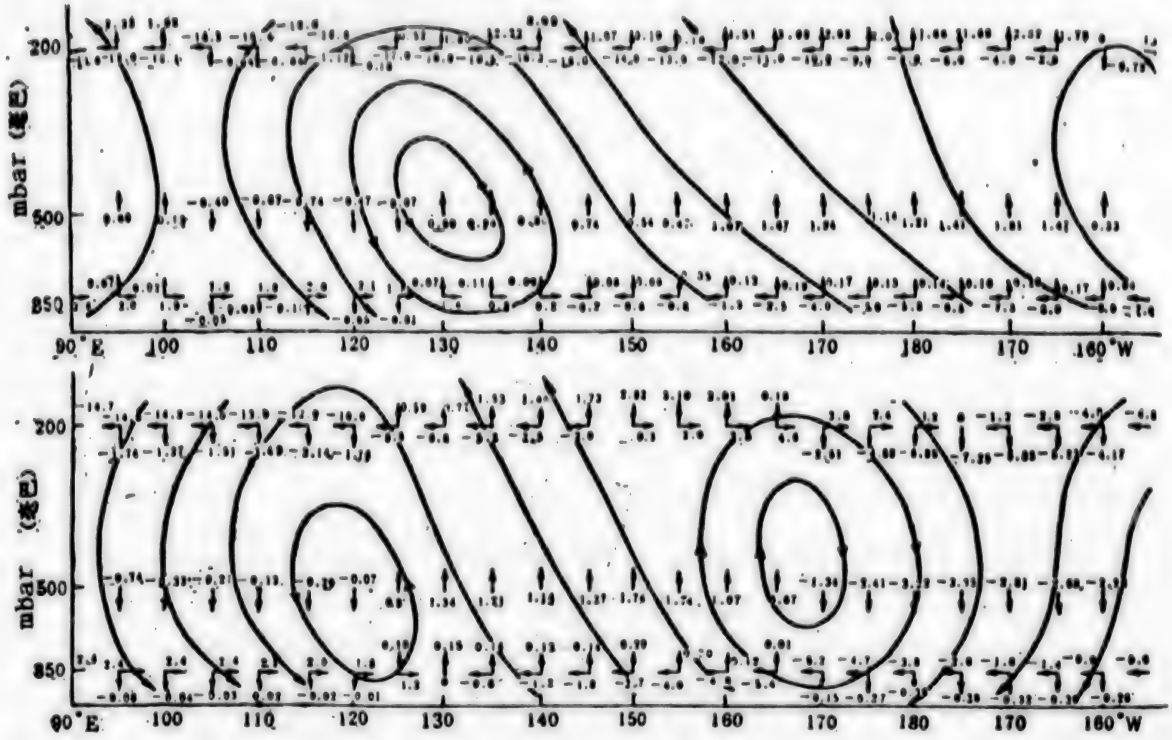

Figure 3. Average zonal circulation near equator (Units: V in m/sec; W in m/sec.) Top of diagram for warm water periods, bottom diagram for cold water periods.

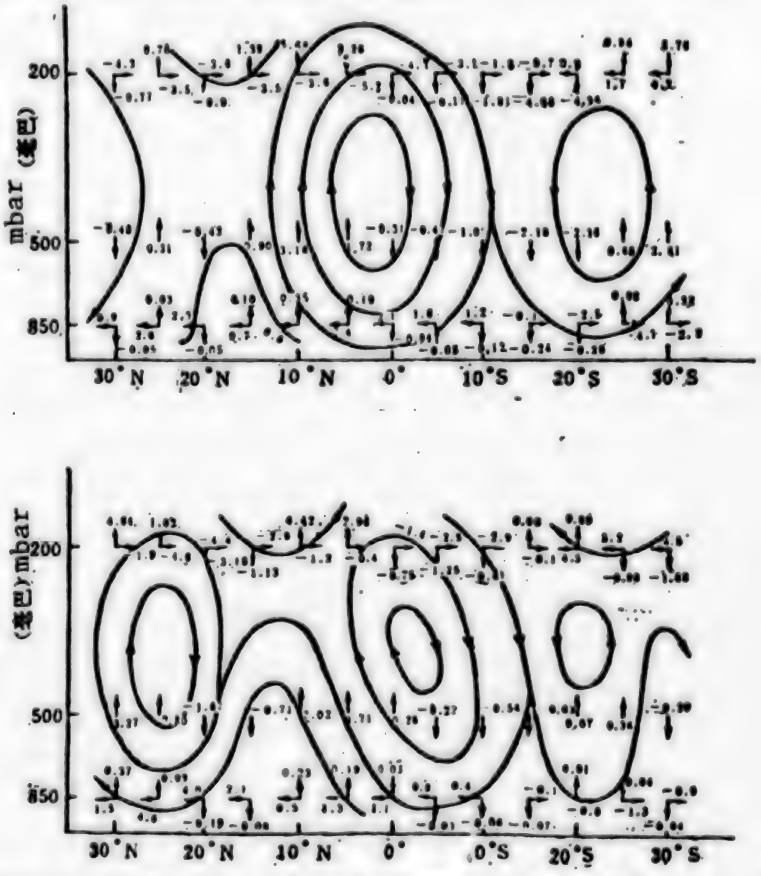

Figure 4. Average meridional circulation at 105-130° E (explanation same as for Figure 3).

3. The Mechanism of Ocean-Atmosphere Interaction

A relatively early investigator of the ocean-atmosphere interaction from the theoretical point of view was Adem[20], who did not take into account the feedback in the atmospheric movement process but paid attention only to ocean-atmosphere heat exchange in order to predict monthly average atmospheric movement and ocean temperature. Gabrilin and Monin[21] took account of the production of clouds by atmospheric movement and their regulation of radiation effects on ocean temperature distribution; this type of ocean-atmosphere heat exchange model could cause long-period oscillations in the atmosphere on the monthly time scale; the model allowed for control of clouds by atmospheric circulation and accordingly the effect of ocean temperature distribution. However, this is indirect, and they did not take direct account in dynamic terms of the effect of air circulation on ocean heat distribution. In this respect Pegukhov and Feyel'son[22, 23] took further account, by thermodynamic methods, of the different effects of different cloud systems on solar radiation. They did not take account of atmospheric feedback, but they derived the existence of an ocean influence on long-term atmospheric processes. The work by the "Long-Term Numerical Weather Forecasting Group"[24] was similar to the above investigation. But it differed somewhat in regard to dynamic processes: first, by means of a parametric method in which they used the flow field vorticity to control the cloud cover and the cloud cover to regulate the ocean surface radiation, they determined the adaptation of atmospheric flow field to sea temperature. These works aimed at explaining the effect of sea temperature on long-term weather processes; Egger[25] used a two-layer model and made a quantitative calculation of the effect of the altitude field of the atmospheric isobaric surfaces on sea temperature and stressed the effect of large-scale atmospheric motion in the tropics on sea temperature anomalies.

But in recent years, understanding of this area has become deeper; according to the viewpoints described above, in the contradiction in the ocean-atmosphere interaction the ocean is the predominant element and the atmosphere is passive and controlled. But according to Lin Xuechun's [2651 1331 2797] analysis[7], ocean-temperature anomalies are caused by atmospheric movements. Davies[26] has likewise pointed this out. Quinn[27] has discovered that the air pressure gradient between Easter Island and Darwin changes ahead of sea temperature anomalies, while Wyrtki[28] has proved that circulation anomalies can produce the El-Nino phenomenon, and Salmon and Hendershott[29] have shown by numerical investigations that this sort of sea temperature anomaly can be the result of atmospheric circulation. A. G. Connejo-Garrido and P. H. Stone[30] pointed out on the basis of a theoretical analysis of the data that sea temperature anomalies only alter evaporation, while maintenance of the Walker circulation is based primarily on condensation heating, and owing to the effect of clouds on radiation, the rising branch of the Walker circulation and the location of high ocean temperature do not coincide, so that the sea temperature gradient has only a secondary effect on the Walker circulation. Recently

Frankignoul and Hasslmann[31] investigated the ocean-atmosphere interaction and came up with clearly reliable results; they used a random-movement model, and took short-period atmospheric movements as the input (similar to "white noise"), obtaining long-period sea-temperature output (similar to "pink noise"), which shows that the development of anomalous sea temperatures is primarily the result of dynamic effects from atmospheric motions above it. The ocean-atmosphere interaction is a nonlinear process, and investigations of this aspect are currently rather scarce, but Pedlosky[32], while ignoring the beta effect, derived the result that in the process of ocean-atmosphere interaction, atmospheric circulation can produce positive feedback strengthening sea-temperature anomalies; this further confirms the importance of atmospheric circulation effects in sea temperature anomalies.

We believe that the ocean and atmosphere interact together, adapt to each other and regulate each other[33], and under certain circumstances atmospheric movements can produce sea temperature anomalies; but under other conditions, sea temperature heating can exercise control over atmosphere movement anomalies. As to which of the aspects of the sea-atmosphere contradiction is predominant, this depends on the location, the time and the conditions. In general, compared with the oceans, the atmosphere is an active element, and especially in the tropics atmospheric motions are of this type. Accordingly, sea temperature anomalies are mainly controlled by atmospheric movements. This type of process is primarily Eckman pumping, produced by the surface currents driven by low-level wind shear and by the wind shear itself, which causes the ocean surface to well up, and regulation of radiation by atmospheric cloud cover. Of these, the last two have a synergistic effect; for example, the shear vorticity of cyclonic circulation in the atmosphere near the ocean surface causes cold water to well up, and cloud cover which is proportional to the cyclonic circulation vorticity also controls the quantity of short wave radiation, resulting in a decrease in the ocean temperature. Recent investigations make it clear that the temperature anomalies are primarily governed by atmospheric circulation anomalies, particularly anomalies in the north-south wind fields on the ocean surface[34], which lead to meridional gradient anomalies in sea temperature, while the atmospheric flow field regulates the sea temperature field[33], producing a new circulation which in turn can affect sea temperature distribution[35], and sometimes even changes the initial sea temperature distribution, decreasing the sea temperature anomaly[36].

On the basis of the above analysis, we can get a picture of ocean-atmosphere interaction. Atmospheric circulation anomalies in the equatorial ocean areas, such as an anomalously high weight for the northern and southern trade winds, indicating strong Hadley circulation, and a north-south motion imparted to ocean currents by the wind, such as the intensification of the California Current in the eastern Pacific and development of the Kuroshio in the western Pacific, produce a warm-north, cold-south meridional gradient in the sea temperature; the atmospheric circulation field adapts to the

sea temperature, with the result that atmospheric east-west winds are strengthened, the Walker circulation is strengthened, and the Hadley circulation is weakened, but because the east-west wind circulation continues to intensify, the initial middle and high latitude cold water mass is transferred southeast, following the west wind drift area, the cold water mass contracts, the cold-south, warm-north sea temperature distribution disappears, the Walker circulation is decreased, and the Hadley circulation is intensified so that the sea temperature anomaly disappears. Thus the interaction and mutual adaptation of the ocean and atmosphere form a closed feedback loop. This feedback process of interaction, mutual regulation and mutual constraint can also be seen in Fig. 5. In the figure, high sea temperatures are coupled almost everywhere with the weight of north-south winds, which is particularly evident in El-Nino years. Moreover, in years where the weight of the equatorial south-north winds is great, the east wind is also strong (figure not reproduced), which indicates that the Pacific gyre is strong, the Kuroshio naturally expands, and accordingly the sea temperature moves upwards, while in the opposite case it moves downwards. Accordingly it is clear that in the ocean-atmosphere interaction, atmospheric and oceanic superlong wave motions have an extremely important part[37, 38, 39].

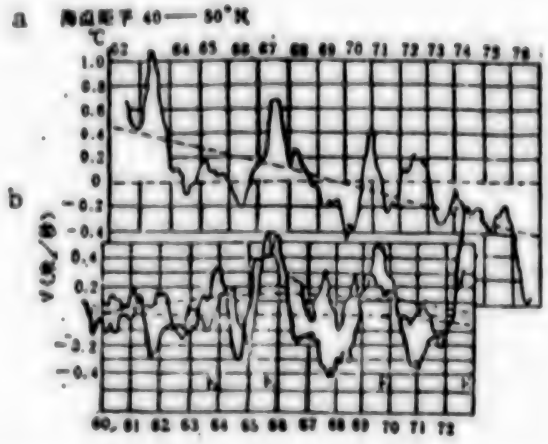

Figure 5. Time change of ocean temperature and north-south wind weight (curve is 7-month sliding average, line is trend line for curve). Heavy line on lower graph is north-south wind weight for northern hemisphere (9-19° N, 125° E-95° W), light line is south-north wind weight for southern hemisphere (1-15° S, 125° E-75° W).

4. The Ocean Temperature and Long-Range Weather Prediction

Large-scale ocean-atmosphere interaction and its use in long-range weather forecasting have become important topics. This can be said to be an important advance in the field. Many foreign investigators, such as those of Ratcliffe and Murray[9], have discovered that atmospheric circulation and

weather changes in the European area have a time-lag correlation with sea temperatures in the Gulf Stream. Many 1-month long-range weather forecasts have been made on the basis of this relationship. The quality of prediction is based on test results: temperature and precipitation predictions showed a correctness of 75 and 66 percent respectively. In the early 1950's some in this country investigated this problem, noting that the temperature of the Kuroshio and Oyashio in the northwestern Pacific were closely related to the wetness or dryness of the summer in certain parts of the east of the country[40]. In recent years, a good deal of work has been done here, and many discoveries of practical and theoretical importance have been made.

The Long-Range Weather Forecasting Group[41] of the Institute of Atmospheric Physics, CAS analyzed the relationship between temperature departures in the northern Pacific and flood-season precipitation in the eastern part of our country. They discovered that the temperature of the Kuroshio and Oyashio during the previous winter showed a clear correlation with the flood-season precipitation in the middle and lower reaches of the Yangtze and in the North China Plain. This correlation began at the end of the previous fall and continued to the beginning of spring, and in the Kuroshio it started in the lower latitudes and gradually moved northward along the Kuroshio. At the same time, the correlation increased. By January the scope of the correlation and the correlation coefficient reached their maximum, decreasing thereafter (see Fig. 6). On the basis of this time-lag correlation, they suggested using ocean temperature as a long-range weather forecasting method. The forecasting department of the Yangtze Valley Planning Office Hydrographic Department[42] discovered that the strength of the Kuroshio was correlated with the wetness or dryness of the flood season in the Dongting and Boyang lake region, and Zhang Yan [4545 3238] et al.[43] discovered that the temperature of the Kuroshio was also correlated with the beginning of the Plum Rains in the Yangtze Valley and with their quantity and duration; the results were used in actual forecasting. The Institute of Geography, CAS[44] also used the northern boundary of the Kuroshio and the date of disappearance of floating ice and established a correlation with precipitation in the Yangtze valley. Li Hongzhou [2621 7703 3166][45] analyzed the relationship of the Kuroshio and Oyashio to the flood-season precipitation in the North China Plain and proposed some long-range forecasting indicators.

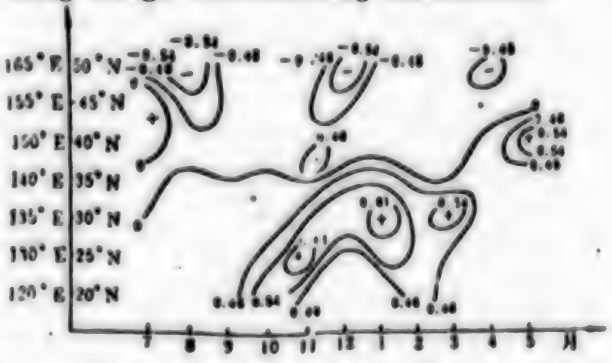

Figure 6. Month-by-month variation of coefficient of correlation between ocean temperature at points on the Kuroshio and June precipitation in Yangtze valley.

In addition to the Kuroshio and Oyashio areas, the equatorial area of the eastern Pacific is also a key area influencing this country's long-term weather. An analysis by Chen Lieting[6] indicates that the extent to which cold water extends westward in the equatorial Pacific in the spring and the extent to which warm water extended southward along the west coast of South America were correlated with the activity of the Pacific subtropical high at the beginning of summer. It was also discovered that the circumstances of its connection with the main body of the eastern subtropical high and the western subtropical high pressure ridge were not the same. Regarding the main body of the subtropical high, the conclusions were in accordance with those of Bjerknes, namely that when the ocean temperature in the equatorial eastern Pacific was high, the body of the subtropical high was strong, and otherwise it was weak. The situation was the reverse for the western subtropical high pressure ridge. The sea temperature in spring in that region was negatively correlated with June precipitation in the middle and lower Yangtze valley. Research by Xu Qun [1776 5028][46] indicates that when the sea temperature along the Peruvian coast is high in the winter, the onset of the Plum Rains season in June along the middle and lower Yangtze is late, and conversely. The long-range weather forecasting group of the Institute of Geography, CAS, analyzed the effect of the tropical ocean on long-term changes in subtropical highs, and discovered that both the tropical sea temperature and the area index of the subtropical high showed variations with periods of 2-3 months and 3 1/2 years. There was also a clear time-lag correlation: changes in the subtropical high lagged about one or two seasons behind changes in ocean temperature. They used this relationship to forecast subtropical high activity and flood-season precipitation in the eastern part of this country.

In addition, it has been pointed out that the ocean temperature in the west wind drift region of the northern Pacific and certain other regions affects our country's long-term weather, and experience makes it clear that when making long-range weather forecasts, in addition to taking account of ocean temperature in key areas, it is important to understand the ocean temperature field characteristics of the entire Pacific. Lin Xuechun[1] analyzed the large-scale distribution of temperature departures in the northern Pacific in winter, categorized them in two large opposed sea-temperature patterns and related the sea temperatures to the spatial distribution of flood-season precipitation in the eastern part of this country, providing data for forecasting.

In recent years the use of ocean temperature for long-range precipitation forecasting and the like has been shown to be effective in practice. For example, an analysis of 5 years of test reports from the Institute of Atmospheric Physics, CAS shows a remarkable agreement in trend forecasts.[47] Setting up a five-level standard, for the middle and lower Yangtze and the North China Plain, with the exception of 1974 when prediction and actuality for the north China Plain differed by one level, all other forecasts were in agreement with the actual situation. Currently this method has become

one of the most important long-range forecasting methods of certain stations in this country's meteorological and hydrological departments.

In addition, in recent years people abroad have also begun to take account of research on long-term numerical forecasting of oceanic and atmospheric interaction effects[20, 24], but currently these are in the experimental stage. In addition, some have begun to use large computers in a series of numerical experiments on the ocean's influence on long-term weather processes; although the results cannot yet be used in long-range forecasting, they are important in deepening people's understanding of the physical nature of long-term weather changes and in establishing long-range forecasting methods on a physical basis.

5. Conclusions

As described above, in recent years research on the ocean-atmosphere interaction has made clear progress here and abroad. Some intrinsic connections have been discovered in the interaction of ocean temperature and atmospheric movement and a relatively rich body of data has been accumulated. These results have opened new and promising paths of investigation of weather processes, particularly the development of and anomalies in long-term weather processes.

On the basis of this systematic material, theoretical research on the mechanism of the ocean-atmosphere interaction is growing day by day and understanding of the interaction is becoming increasingly profound and complete. In particular, new ideas have emerged on the relationship between ocean temperature anomalies and anomalous development of long-term weather processes.

On the theoretical and practical basis described above, certain meteorological, statistical and dynamic methods have developed in long-range weather forecasting.

There are of course many problems connected with this research which urgently require profound study and solution.

First, the question of which side of the ocean-atmosphere interaction is the driving element is currently rather unclear, and the question of which becomes preeminent under what conditions, are still awaiting profound study. Fig. 5 shows that the mutual constraint of ocean and atmosphere has an internal consistency. Accordingly there is between them a relationship of negative feedback and mutual regulation which prevents anomalies in them from developing into serious imbalances; the El-Nino phenomenon can be considered the initial stage of such an imbalance, but the question of why this imbalance is rapidly and automatically checked still needs more profound study.

Second are questions of time scale of ocean-atmosphere interaction effects. Ocean temperature anomalies are governed by movement of ocean currents,

which are in turn driven by wind fields with relatively slow circulation speeds; accordingly in large-scale terms, the sea temperature anomalies produced by atmospheric anomalies may be rather rapid ones. And as Fig. 5 shows, in general when equatorial north-south winds are intensified, anomalous temperatures are produced in the 30-40° N area, taking 20 months to develop, a time scale which is generally in agreement with the estimated time scale. This is the time scale for temperature distribution adjustment to wind fields. However, adjustment of atmospheric movement temperature anomalies may be on a longer time scale. Because ocean effects on the atmosphere are a heating process, there must be an accumulation process, and after a long time period, ocean heating clearly affects weather processes. Clear understanding of this problem will be very important for long-range prediction.

Third, current investigations of the ocean-atmosphere interaction are generally limited to a single factor or a single sea area, but atmospheric movements, particularly the long-term ones, are affected not only by the oceans but also by plateau thermodynamic and dynamic factors, atmospheric radiation heating, polar ice and snow cover. Accordingly the comprehensive study of the ocean-atmosphere interaction should be made from the viewpoint of general atmospheric circulation so as to further clarify the effects of the oceans in the atmospheric general circulation. Only when plateau effects are taken into account will it be possible to clarify the relationship between ocean temperature anomalies and monsoon and Plum Rains circulation anomalies[48]. This is of great importance in relation to East Asian atmospheric circulation and long-range weather processes. Research on the relationship between the ocean-atmosphere interaction in the western Pacific on the one hand and subtropical high activity and the East Asian monsoon rains on the other has already made much progress, but it would seem that only when it is studied from the overall East Asian viewpoint will it come to the heart of the matter.

To sum up, the ocean-atmosphere interaction unquestionably has a prominent place with regard to development of and anomalies in long-term weather processes. Research on the ocean-atmosphere interaction should be a key topic in long-range weather forecasting.

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8480
CSO: 4008

APPLIED SCIENCES

PCR GLACIOLOGY, CRYOPEDOLOGY SOCIETY, JOURNAL FOUNDED

OW270726 Beijing XINHUA in English 0713 GMT 27 Mar 80 OW

[Text] Lanzhou, 27 March (XINHUA)--All scientists, both Chinese and foreign, who contribute to the cause of glaciology (study of glaciers) and cryopedology (science of frozen soil), will be invited by the Chinese Society of Glaciology and Cryopedology to become honorary members.

This was decided at an inaugural meeting of the society last week.

The decision was made to encourage academic exchanges both at home and abroad to develop this science in China.

Not only can scientists, engineers, technicians and researchers join the society but worker-peasant innovators and amateurs interested in the subject can also apply to join.

The meeting elected Shi Yafeng as president of its council and decided that no members of the latter should exceed three terms of office (each term being 3 years), to guarantee that one-third of its council members will be new ones.

The society will publish its own periodical, GLACIOLOGY AND CRYOPEDOLOGY, and take over one of a similar nature edited by the Lanzhou glaciology and cryopedology institute.

The society's financing will be subsidized by the state.

CSO: 4020

BRIEFS

ZHEJIANG ELECTRONICS EXHIBITION--A Zhejiang provincial electronics products exhibition opened on 20 March at the Zhejiang Exhibition Hall in Hangzhou. Electronics industrial departments and more than 200 enterprises in the province are taking part in the exhibition. A preview of the exhibition was attended by responsible comrades of the provincial party committee and people's government, Li Fengping, Chen Zuolin, Xue Ju and Li Kechang. [Hangzhou Zhejiang Provincial Service in Mandarin 0400 GMT 20 Mar 80 OW]

SHANGHAI ELECTRONIC PRODUCTS--Shanghai's Changjiang Radio Plant has succeeded in trial-producing China's first micro-electronic brain for handling data. Tests have determined that its performance is up to world standard. The electronic brain is used for calculating data on the automatic control system in the industrial production process. The Shanghai supersonic instruments plant has succeeded in trial-producing China's first pocket-size supersonic-wave instrument for checking climatic conditions. Shanghai No 27 Radio Plant recently turned out an instrument for determining the performance of television transformers. [Shanghai City Service in Mandarin 1130 GMT 24 Mar 80 OW]

CSO: 4008

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Beijing DONGWU FENLEI XUEBAO [ACTA ZOOTAXONOMICA SINICA] in English
Vol 4 No 3, Aug 79

[Text] Contents

[Note: Each article is accompanied by an English abstract.]

10424
CSO: 4003

LIFE SCIENCES

BRIEFS

SHANGHAI LASER TREATMENT--Shanghai 15 Mar--A hospital in Shanghai has been doing well in treating skin cancers of the head and facial regions with a laser evaporation method. Since 1976, the Shanghai eye-ear-nose-throat hospital has treated 73 patients suffering from cancers of the head and facial regions with a CO_2 laser tumor evaporation set. 76.7 percent of the patients survived the operation for over 2 years. 40 of the 73 cases were those of late-stage cancers in which radiotherapy, surgical operation or medicine failed. After being treated with the CO_2 laser tumor evaporation method, 23 of the 40 patients survived over 2 years. Some of them have returned to work. Dr Liu Deming at the laser laboratory attached to Shanghai No. 1 Medical College is among the doctors who first applied the laser technique to medicine in China. Deming used the l er in the excision of cancers of the head and facial regions, Dr Liu furthe thought of using a laser apparatus to evaporate cancers in order to achieve better results. [OW161441 Beijing XINHUA in English 1121 GMT 15 Mar 80 OW]

ZHEJIANG BLIND-DEAF-MUTE CONGRESS--The first Zhejiang provincial congress of the deaf, mute and blind was held in Hangzhou from 5 to 9 March. Wang Fang, deputy secretary of the provincial CCP Committee and vice chairman of the provincial People's Congress, attended and addressed the meeting. The meeting mainly aimed at uniting and mobilizing all the blind, deaf and mute people in the province to adhere to the four basic principles, to resolutely implement the party's political and ideological lines, carry forward the revolutionary spirit of being "broken in health but not in spirit," and actively join in the four modernizations so as to contribute to the new long march in socialism. Participants studied the 5th plenary session communique and Deng Xiaoping's report on current situation and tasks and pledged to greet the convening of the party's 12th national congress with concrete actions. The meeting also elected committee members of the Zhejiang provincial association of the blind, deaf and mute and delegates to the 3d national congress of the blind, deaf and mute. [OW161441 Hangzhou Zhejiang Provincial Service in Mandarin 1100 GMT 11 Mar 80 OW] Zhejiang Province held its first blind and deaf-mute persons congress in Hangzhou from 5 March to 9 March. The meeting elected and founded the first Zhejiang provincial blind and deaf-mute persons association. Wang Fang, deputy secretary of the Zhejiang Provincial CCP Committee and vice chairman of the

provincial People's Congress Standing Committee, attended and addressed the meeting. The meeting also elected Zhejiang's deputies for the third national blind and deaf-mute persons congress. [Hangzhou Zhejiang Provincial Service in Mandarin 0400 GMT 19 Mar 80 OW]

HUBEI PUBLIC HEALTH CONFERENCE--The participants to the recent conference of the directors of the prefectural and municipal public health bureaus and epidemic prevention stations throughout Hubei demanded that the various areas further strengthen cooperative medical services in the countryside. It was revealed that in the past 3 years, 5,000 barefoot doctors were dispensed with throughout Hubei. As a result, the percentage of brigades which used to have cooperative medical services were reduced from 98.6 percent in 1977 to 89.9 percent. It was pointed out that barefoot doctors are the backbone elements for running the cooperative medical services well. They must not be done away with as nonproductive personnel. It was decided that the cooperative medical services throughout the province must be rectified this year. [Wuhan Hubei Provincial Service in Mandarin 1100 GMT 14 Mar 80 HK]

HEILONGJIANG HEALTH CAMPAIGN--On 18 March, the Heilongjiang Provincial CCP Committee and the provincial People's Government held a telephone conference calling on all localities in the province to launch a spring patriotic health campaign. Chen Jianfei, secretary of the provincial CCP Committee and vice governor of Heilongjiang, presided over the conference. Li Jianbai, secretary of the provincial CCP Committee, addressed the meeting. He urged the people to strive to wipe out the "four pests"--rats, bed bugs, flies and mosquitoes--improve environmental sanitation and prevent local recurrent and contagious diseases. He demanded rural areas to pay more attention to management of water and nightsoil and the improvement of water wells, toilets, animal pens, cooking stoves and surroundings. [Harbin Heilongjiang Provincial Service in Mandarin 2200 GMT 18 Mar 80 OW]

CSO: 4008

AUTHOR: ZENG Xiaozhen [2582 1321 4631]
WANG Yanjiang [3769 1693 5328]

ORG: None

TITLE: "Airborne Electromagnetic System (Pulse Type) and Its Application in Geological Mapping and Prospecting"

SOURCE: Changchun CHANGCHUN DIZHI XUEYUAN XUEBAO [JOURNAL OF THE CHANGCHUN GEOLOGICAL INSTITUTE] in Chinese No 3, 1979 pp 1-9

ABSTRACT: This paper introduces the properties and characteristics of the pulse type airborne electromagentic system, M-1, made jointly by Changchun Geological Institute and Heilongjiang Provincial Bureau of Geology. Theoretical computation and model experimentation provide a graphic interpretation of the electromagnetic response, with results of different elevations combined on one graph for convenience of application. Data of actual airborne measurement are used to prove that it is feasible and effective to use that pulse electromagnetic system for mapping and prospecting.

AUTHOR: LU Liangzhao [4151 5328 0340]
ZHENG Songyan [6774 2646 1750]
YE Huiwen [0673 1920 2429]

ORG: None

TITLE: "Discussion on the Characteristics and Origin of the Mineral Couple of Garnet--Clino pyroxene in Granulite Facies of the Kaolin Region in Miyun County"

SOURCE: Changchun CHANGCHUN DIZHI XUEYUAN XUEBAO [JOURNAL OF THE CHANGCHUN GEOLOGICAL INSTITUTE] in Chinese No 3, 1979 pp 10-25

ABSTRACT: The metamorphic mixed rocks, cropping out in the Kaolin region of Miyun County, uniformly contain garnet. Especially in the metamorphic rocks of basic hornblende, the content is very high. Bands of garnet and paragenetic monoclinal pyroxene are distributed everywhere in the entire region. Based upon the litho-chemical data of this type of metamorphic rocks and the mineral data of the garnet and pyoxene, this paper proceeds with paragenetic analysis to determine the condition of material and chemical balance. Studies on the structure of the minerals confirmed the metamorphic reaction to the paired garnet--monoclinal pyroxene. Combined with certain experimental data reported in related literature, the P - T condition of metamorphic action of this region reflected in these minerals is analyzed.

AUTHOR: LIU Xishan [0491 0823 1472]

ORG: None

TITLE: "Preliminary Analysis of Relict Fabric of Metamorphic Rock in Iron Region of Qianan"

SOURCE: Changchun CHANGCHUN DIZHI XUEYUAN XUEBAO [JOURNAL OF THE CHANGCHUN GEOLOGICAL INSTITUTE] in Chinese No 3, 1979 pp 26-34

ABSTRACT: This region contains bedded, bed-like, and lens-like bands of magnetitic quartz, which have all received metamorphic action of granulite facies. Migmatization is uniform, expressed primarily as a remelting action, accompanied by replacement action, but the degree of migmatization is not high to cause the restoration study possible. Although many methods of restoration exist, the use of relict structure for restoration to study the condition of iron mineral formation is more direct and effective than such methods as litho-chemistry, trace element study, etc. This paper, therefore, emphasizes a discussion of the relict fabric of deeply metamorphic rocks.

AUTHOR: MU Shimin [4476 4258 2404]
LI Shihua [2621 0013 5478]

ORG: None

TITLE: "Collection of Diagrams of the Theoretical Curve of the Second Derivative of ΔZ"

SOURCE: Changchun CHANGCHUN DIZHI XUEYUAN XUEBAO [JOURNAL OF THE CHANGCHUN GEOLOGICAL INSTITUTE] in Chinese No 3, 1979 pp 35-48

ABSTRACT: This paper discusses a group of 110 diagrams of isopleth curves of the second derivative of ΔZ of the 4 regular-shaped bodies of the sphere, the horizontal cylinder, the thin plate, and the thick plate. Due to limitation of space, only 72 of these diagrams are reproduced. The basic hypotheses and the symbols used in the diagrams are explained.

AUTHOR: WANG Shichen [3769 0013 4468]
WU Xisheng [0702 6932 3932]
XIA Lixian [1115 4539 7359]
CAO Xuyan [2580 4872 6056]
MIN Fande [7036 0416 1795]

ORG: None

TITLE: "Application of Mathematical Geology in Regional Investigation With a Scale of 1 : 50000"

SOURCE: Changchun CHANGCHUN DIZHI XUEYUAN XUEBAO [JOURNAL OF THE CHANGCHUN GEOLOGICAL INSTITUTE] in Chinese No 3, 1979 pp 49-60

ABSTRACT: Polynomial statistical analysis is a method of processing, interpreting, simulating, and quantitatively describing the principles of spatial, temporal, and material composition changes of related geological entity in regional geological surveys. Results of polynomial statistical analysis may provide considerable information of regional geology and mineral deposits through a clarification of the various geological and geochemical elements. An analysis of a Neocathaysian system in Jilin Province with primarily gold and copper deposits is provided to illustrate the technique.

AUTHOR: FAN Jizhang [5400 4949 4545]

ORG: None

TITLE: "Application of Poly-Statistical Analyses in the Restoration of Original Metamorphic Rock"

SOURCE: Changchun CHANGCHUN DIZHI XUEYUAN XUEBAO [JOURNAL OF THE CHANGCHUN GEOLOGICAL INSTITUTE] in Chinese No 3, 1979 pp 61-67

ABSTRACT: It is generally believed that the relative contents of chemical groups remain constant before and after metamorphosis. Under the metamorphic action of different nature and intensity, complicated groupings of minerals may appear, but contents may still be compared with those of standard original rocks. Restoration of metamorphic original rock is in fact a process of mathematical classification, but the complex computation has not been feasible until the electronic computer becomes extensively available. This paper reports the use of poly-statistical analysis for quantitative processing of lithochemical analysis data of the northern slope of East Qinling Mountains. Through point and group analyses and correspondence analyses, the normal metamorphic rocks (igneous or volcanic rocks) and the secondary metamorphic rocks (sedimentary rocks), both extensively distributed on the northern slope, are separately identified. The objective of the study is to demonstrate the procedure of applying the technique.

AUTHOR: None

ORG: None

TITLE: "Dr. WANG Naiding [3769 0035 7844], a Chinese Residing in West Germany Pays a Visit in Changchun Geological Institute"

SOURCE: Changchun CHANGCHUN DIZHI XUEYUAN XUEBAO [JOURNAL OF THE CHANGCHUN GEOLOGICAL INSTITUTE] in Chinese No 3, 1979 p 60

ABSTRACT: Dr. WANG Naiding, a mineralogist and petrologist of University of Heidelberg, West Germany and his wife visited the institute 24-26 Aug 79. After a tour of the laboratories and museums, he was invited by teachers and cadres of the institute to report on higher education on geology in West Germany. He also participated in meetings discussing problems concerning x-ray test techniques, experimental studies on rock formation and mineralization, etc. Dr. WANG claims that the institute's equipment is not inferior to that of foreign universities. When he learned that most of the instruments had been hand made by the teachers, he was very impressed. He said that in West Germany students do not have to attend lectures but laboratory work is considered essential. Studies on basic theories are also emphasized. Examinations are mostly oral.

AUTHOR: YANG Tianxing [2799 1131 5887]
FU Zezhou [0102 3419 0719]

ORG: None

TITLE: "Two-Dimensional Function δ and Its Application in the Movement of Unstable Flow of Water"

SOURCE: Changchun CHANGCHUN DIZHI XUEYUAN XUEBAO [JOURNAL OF THE CHUNGCHUN GEOLOGICAL INSTITUTE] in Chinese No 3, 1979 pp 68-86

ABSTRACT: This paper discusses a new definition of the two-dimensional function δ and a new characteristic to enable it to be used to resolve certain initial boundary problems of unstable movement of ground water toward a well. After the introduction of δ function, the non-homogeneous initial boundary problem is transformed into a problem of resolving homogeneous initial boundary. The increasing characteristic of the result may be directly applied to obtain the variable flow under different boundary conditions, or the equations of an interference well with water withdrawn at different intervals, including conditions of overflow supplement and double-level overflow supplement.

AUTHOR: WANG Dongpo [3769 2639 0980]

ORG: None

TITLE: "Recent Developments in Petrology of Sedimentary Rocks"

SOURCE: Changchun CHANGCHUN DIZHI XUEYUAN XUEBAO [JOURNAL OF THE CHANGCHUN GEOLOGICAL INSTITUTE] in Chinese No 3, 1979 pp 87-92

ABSTRACT: This paper reviews studies in sedimentology in the past 20 years. For the purpose of discussion, the field is divided into (1) studies on clastic rocks of continental original; (2) studies on silicates; (3) studies on the theory of sedimentation; (4) studies on rock formation actions; (5) studies on sedimentary facies and paleogeography. Aside from Chinese works on classifications of silicates, by YE Zhisheng [2814 3112 6927] (1964), Chengdu College of Geology (1974), etc. literatures mentioned in the paper are of Western origin.

AUTHOR: SHAN Zeming [1472 0463 0682]
WU Yaocheng [2976 6460 2052]
KONG Qingcun [1313 1987 1317]

ORG: SHAN, WU of Changchun Geological Institute; KONG of Zhaoyuan Gold Mine, Shandong Province

TITLE: "New Developments in the Study of Character of Variation of Ore Bodies"

SOURCE: Changchun CHANGCHUN DIZHI XUEYUAN XUEBAO [JOURNAL OF THE CHANGCHUN GEOLOGICAL INSTITUTE] in Chinese No 3, 1979 pp 93-98

ABSTRACT: The ore body is the object of mineral prospecting and mining. The character of an ore body is often described with parameters of shape, genetic characteristic, grade, thickness, etc. These parameters vary with different ore bodies and sometimes with different positions of a single ore body. In early 1960's, D.G.Krige of South Africa proposed a method of computing the grade and reserve of ore deposit to cause the error of estimate to be at the minimum. This is the beginning of geological statistics, which emphasizes the relationship between space and quantitative variation of the ore body. Since then, G. Matheron of France has made improvements to the technique and named it Krige Method. In China, ZHAO Pengda [6392 7720 1129] proposed the adoption of a "variable exponent" $t = \frac{}{n-2}$ for quantitative determination of the characteristic of variation of an ore body. Matheron and others further proposed ore body mathematical models. Based upon these concepts, a study on the character of variation of the gold deposit of Zhaoyuan is carried out by the authors and briefly reported.

AUTHOR: GUAN Ping [1351 1627]

ORG: None

TITLE: "The Diwa [Land Combe] Theory and Significance of Its Study"

SOURCE: Changchun CHANGCHUN DIZHI XUEYUAN XUEBAO [JOURNAL OF THE CHANGCHUN GEOLOGICAL INSTITUTE] in Chinese No 3, 1979 p 99, 67

ABSTRACT: The Diwa Theory was proposed by the Chinese structural geologist, Prof. CHEN Guoda [7115 0948 6671] in 1956. It has since been developed into a new theory of the evolution of the movement of the earth's crust. Since the 1930's Chinese and foreign geologists have become attracted by the phenomena of tectonic magma activities since the Middle Neozoic Era in the eastern platform region of China and other similar regions. Terms, such as para-geosyncline, para-platform, active platform, etc. have been used to described such regions until the Diwa theory which designates it as the third tectonic unit, parallel to geosyncline and platform. The study of this theory and its application in mineralization research had been interrupted in China by the gang of four, while it was producing important influences abroad, especially in the Soviet Union. The theory is briefly discussed in the paper, which also reports Prof. CHEN's recent lecture on the theory at Changchun Geological Institute.

AUTHOR: LIU Maoqiang [0491 5399 1730]

ORG: None

TITLE: "Characteristic, Age, and Correlation of Late Triassic Flora in Northern Guangdong"

SOURCE: Changchun CHANGCHUN DIZHI XUEYUAN XUEBAO [JOURNAL OF THE CHANGCHUN GEOLOGICAL INSTITUTE] in Chinese No 3, 1979 pp 100-113

ABSTRACT: In 1970-1972, the author and members of the Chinese Academy of Geology carried out a survey of coal-containing Cenozoic strata in Lechang, Qujiang, Shaoguan, Ruyuan, Lianping of Northern Guangdong and Yizhang of Hunan. A preliminary study was completed with respect to the stratigraphic sequence, sedimentary facies, and characteristics and age of animal and plant fossils of that region. Moreover, a coal-containing group of strata was also discovered during the survey in the western part of Yingde, which is located in the southern tip of North Guangdong, with plant and Lamellibranchiata fossils corresponding to those of the Genkou Formation.A list of plant fossils collected has been included in the book, ZHONGNAN DIQU HUASHI TUCE [FOSSILS OF THE MIDDLE SOUTH REGION] Vol 3; therefore, no description is given in the paper. Aside from the relationship of the Late Triassic flora and paleogeography, its relationship with floras of Northern Europe and Greenland is extensively analyzed.

AUTHOR: WANG Xinghua [3769 5281 5478]

ORG: None

TITLE: "Views on Epigenetic Animal Fossils in Mashan Group of Heilongjiang Province"

SOURCE: Changchun CHANGCHUN DIZHI XUEYUAN XUEBAO [JOURNAL OF THE CHANGCHUN GEOLOGICAL INSTITUTE] in Chinese No 3, 1979 pp 114-116

ABSTRACT: Rocks with strange shell-like pattern on the weathered surface were discovered in Longshanling Mine of Jixi City of Heilongjiang Province in Sep 77. Subsequently, they were identified by Northeast Institute of Geology as Ediacara fossils. The author had an opportunity of examining these fossils in 1978 and discovered that these "fossils" are produced in a tectonic zone of high pressure crushed rocks. Slides are made of the fossils for laboratory observation and they are discovered to be not fossils at all. They are in fact products of combined actions of tectonic movement, heat, fluid, [illegible]ering, and erosion. The geological condition, the structure of petolog[illegible] grouping, and the characteristic of the group of minerals are examined [illegible] conditions of existence of fossils are not discovered.

AUTHOR: ZOU Zurong [6760 4371 2837]

ORG: None

TITLE: Stable Isotope Geochemistry and Its Application in the Study of Ore Deposits: (III) Sulfur Isotopes Geochemistry"

SOURCE: Changchun CHANGCHUN DIZHI XUEYUAN XUEBAO [JOURNAL OF THE CHANGCHUN GEOLOGICAL INSTITUTE] in Chinese No 3, 1979 pp 117-126

ABSTRACT: Many metals, especially colored metals, exist as sulfides in the ore deposits; therefore; it is extremely important, in the investigation of mineralization, to study sulfur isotopes geochemistry. A large quantity of data have been accumulated concerning the ratio of sulfur isotopes in rocks, ores, minerals, and natural waters, and there are also many laboratory works, theoretical summations, and discussions on the subject. When sulfur isotopes are understood, it is relatively simple to understand the geochemical theories of other light isotopes, such as oxygen, carbon, and hydrogen. This lecture includes the following chapters: (1) The basic concept; (2) Thermodynamic effect of separation distillation of sulfur isotopes; (3) Geological thermometer of sulfur isotopes; (4) Effects of fO_2 and pH on distillation of sulfur isotopes.

6168
CSO: 4009

AUTHOR: YU Tianren [0060 1131 0088]

ORG: Nanjing Institute of Soil Science, Chinese Academy of Sciences

TITLE: "The Development of Soil Physical Chemistry in China"

SOURCE: Beijing TURANG XUEBAO [ACTA PEDOLOGICA SINICA] in Chinese No 3, Aug 79 pp 203-210

TEXT OF ENGLISH ABSTRACT: A critical review of the historical development of soil physical chemistry in China is made. The main points are summarized as follows:

1. Chemical studies of soils:

Chemical studies of soils, which is considered as the initial stage of the development of soil physical chemistry in China, started in the early thirties of this century. They mainly dealt with the chemical composition and exchangeable cations in relation to the genesis and classification of soils. Some works on quick test have also been made. Only very limited number of workers have devoted to some physico-chemical properties of soils such as amphoteric behavior, phosphate fixation and effect of pH on the color of humus. It was on this weak foundation that soil physical chemistry has been developing since the establishment of the People's Republic.

[Continuation of TURANG XUEBAO No 3 Aug 79 pp 203-210]

2. Studies on soil colloid:

In a series of papers by Dr. Hseung Yi and his coworkers, the mineralogical composition of the colloidal fraction of a variety of soil types was studied by means of chemical analysis, X-ray diffraction and differential thermal analysis. Some works on swelling and shrinkage, potentiometric titration curve, electrophoresis, and dispersion and flocculation of soil colloid have also been carried out.

3. Organo-mineral complexes:

The primary aims of this work were to find out the difference in chemical properties between "fertile soil" and "infertile soil" and to explain the role of farm manures and green manures in the melioration of soils. The complexes were fractioned as water-dispersable, sodium-dispersable and sodium-plus-rubbing dispersable. Attempts have also been made to interpret the mechanism of complex formation.

4. Oxidation-reduction processes:

This is one of the most detailed studies in soil physical chemistry in China. The subjects included the different sorts and characteristics of the most

[Continuation of TURANG XUEBAO No 3 Aug 79 pp 203-210]

frequently encountered redox systems, the interactions among these systems, the redox status of principal soil types of China, and the effect of oxidation-reduction processes on soil fertility. The present writer, as one who has been participating in this field of study, however, considers that we have just got over the initial stage of looking for the main direction of research, and that there are many theoretical problems remained to be solved.

5. Acid-base equilibria:

Attention has been paid to the soil acidity in relation to exchangeable hydrogen and aluminum as well as to the process of transformation of hydrogen clay to aluminum clay. The nature of acid sulfate soils and the cause of the change of pH in redox processes have also been studied. Based on a large number of pH determinations, a generalized map of pH of surface soils of China has been compiled. Relatively little work was done on soil alkalinity.

6. Electrochemical properties:

The book entitled "Electrochemical Properties of the Soil and Methods for Their Investigation" was published in 1965. Recent progresses in this field includes the extensive application of ion-selective electrodes for soil studies. Attempts

[Continuation of TURANG XUEBAO No 3 Aug 79 pp 203-210]

have been made for determining the pH and the mean activity of NaCl directly in the field. At a recent symposium sponsored by the Chinese Society of Soil Science, various aspects of electrochemical methods including potentiometry, conductimetry and voltammetry as applied to soil studies have been discussed.

7. Adsoption and exchange of ions:

Attention has been paid to the adsorption and exchange of ions in relation to the nature of the ion and to the characteristics of the soil. It was found that the hydrolytic products of such cations as ammonium, aluminum and manganese were strongly adsorbed by some types of soils. The large amount of ferric oxides in red soils plays an outstanding role in inducing this abnormal behavior of adsorption. Polyvalent cations such as ferrous iron, aluminum and manganese may compete strongly for the exchange sites with nutrient ions such as potassium or calcium.

8. Energy relationships:

Professor Chu Tsu Hsiang has emphasized the intensity factors of nutrient supply for plants, and has attempted to relate the phosphate potential with the lime potential for evaluating the phosphate availability of soils. Other workers have related the bonding energy of cations to the electric charge on clay surface.

[Continuation of TURANG XUEBAO No 3 Aug 79 pp 203-210]

9. Conclusions

Although progresses were made in the last thirty years, soil physical chemistry has not yet played its role sufficiently in the development of soil science of China due to the limited number of scientists participating in this field of study. On the other hand, there has begun some works peculiar to this country with respect to the selection of objects for study and to the development of methods of study, and it is anticipated that soil physical chemistry reflecting the characteristics of soils of China would make some head-way in the near future.

AUTHOR: HUANG Fuzhen [7806 4395 3791]

ORG: Northwestern Institute of Soil Conservation, Biology and Pedology, Chinese Academy of Sciences

TITLE: "The Influence of Earthworm on the Formation of Soil Structure"

SOURCE: Beijing TURANG XUEBAO [ACTA PEDOLOGICA SINICA] in Chinese No 3, Aug 79 pp 211-217

TEXT OF ENGLISH ABSTRACT: This article deals with the favorable influence of earthworm on soil structure formation.

Investigation revealed that most of the smoothly egg-shaped, elliptic or round aggregates in soil were the products of the life activities of earthworm.

Electron microscopic study showed that earthworm played an important part in the formation of organo-mineral complex in soil. Therefore, the aggregates formed by earthworms possessed a higher water-stability and the ability of nutrient supply and retention.

[Continuation of TURANG XUEBAO No 3 Aug 79 pp 211-217]

It is assumed that there is possibility of using the earthworm activity as a means for the improvement of soil fertility.

Thanks are due Gu Xinyun [7357 2450 6663] and Microscope Laboratory, Nanjing Pedology Institute, for assisting in observations with electron microscope, as well as Tang Keli [0781 0344 7787] for providing lens.

AUTHORS: ZHU Zhaoliang [2612 0340 5328]
CHEN Rongye [7115 2837 2814]
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ZHANG Shaolin [1728 4801 2651]

ORG: All of Nanjing Institute of Soil Science, Chinese Academy of Sciences

TITLE: "The Effect of Forms and Methods of Placement of Nitrogen Fertilizer on the Characteristics of the Nitrogen Supply in Paddy Soils"

SOURCE: Beijing TURANG XUEBAO [ACTA PEDOLOGICA SINICA] in Chinese No 3, Aug 79 pp 218-233

TEXT OF ENGLISH ABSTRACT: The present article deals with the patterns of soil N supply, the uptake of soil and fertilizer N by rice plant and the fate of fertilizer N in relation to the forms and methods of placement of N fertilizer in the paddy soils of Suchow District, Jiangsu Province. Field experiment was carried out with ^{15}N-tracer technique. The soils used for the experiment are developed from the alluvial-lacustrine deposits with a texture of clay loam.

Thanks are due Professor Li Qingkui [2621 1987 6652] for revising the draft.

AUTHOR: LIU Xinghua [0491 6821 5478]

ORG: Department of Biology, Yunnan University

TITLE: "A Preliminary Study on Soil Fertility of the Cut-Over Area in Western Sichuan"

SOURCE: Beijing TURANG XUEBAO [ACTA PEDOLOGICAL SINICA] in Chinese No 3, Aug 79 pp 234-244

TEXT OF ENGLISH ABSTRACT: This paper deals with the study by plot experiments on the relationship between soil conditions of different cut-over areas and reforestation. The results showed that the hydrothermal regime of the cut-over area where trees were removed six years ago could possibly meet the needs of growth of regenerated seedlings. Owing to the significant variation of the hydrothermal regime of the surface soil (0-20 cm) of cut over area on the sunny slope at high altitude, it was necessary to take proper sheding measures for the favorable growth of seedlings.

Thanks are due Liang Hanchao [2733 4988 6389], Zhang Shisheng [1728 0013 3932] and Yang Yupo [2799 3768 0980] for revising the draft, as well as Chinese Forestry Research Institute and Sichuan Province Forestry Institute for providing testing specimens.

AUTHORS: LIU Zheng [0491 6927]
ZHU Qiqing [2612 0366 3237]
HAN Yuqing [7281 3768 0530]
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ORG: All of Nanjing Institute of Soil Sciences, Chinese Academy of Sciences

TITLE: "Status of Microelements of Soils and the Crop Growth in Xuzhou and Huaiyin Districts of Jiangsu"

SOURCE: Beijing TURANG XUEBAO [ACTA PEDOLOGICAL SINICA] in Chinese No 3, Aug 79 pp 245-256

TEXT OF ENGLISH ABSTRACT: During past years the status of the trace elements in soils of Xuzhou and Huaiyin districts of Jiangsu province were studied. The main soil type in these districts is yellow fluviogenic soil derived from the alluvium of the yellow river. Analytical results revealed that the soils of these districts are very poor in manganese, molybdenum and zinc, but rich in available boron and copper.

Xu Junxiang [1776 0193 4382], Yin Chuliang [1438 2806 5328], Ouyang Tao [2962 /122 3165], and Qian Chengliang [6929 2110 2856] also took part in the work.

AUTHORS: JIA Dalin [6328 1129 2651]
FU Zhengquan [0265 2973 3123]

ORG: Both of Institute of Irrigation, Chinese Academy of Agricultural Science

TITLE: "Study on the Water Movement in a Sandy Soil by Means of Radioactive Isotope ^{131}I"

SOURCE: Beijing TURANG XUEBAO [ACTA PEDOLOGICA SINICA] in Chinese No 3, Aug 79 pp 257-264

TEXT OF ENGLISH ABSTRACT: In the process of soil water movement, the soil water content in the surface layer of a sandy soil changed firstly in the initial stage. In the duration of time, the layer in which the soil water content began to change gradually moved downward in the soil profile. After a certain time, about 12 minutes, such variation occurred mainly in the middle part of the soil profile and changes either in the surface layer or in the bottom layer of the soil profile were insignificant.

AUTHORS: ZHAO Chengzhai [6392 6134 7872]
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ORG: ZHAO Chengzhai of Nanjing Institute of Soil Science, Chinese Academy of Sciences; ZHAO Weisheng of Zhejiang Agricultural University

TITLE: "The Effect of Soil Compaction and Clod Distribution on the Growth of Rice"

SOURCE: Beijing TURANG XUEBAO [ACTA PEDOLOGICA SINICA] in Chinese No 3, Aug 79 pp 265-276

TEXT OF ENGLISH ABSTRACT: The effect of soil compaction and clod distribution of two clayey soils on the growth of rice in southern Jiangsu province was studied. The distribution of soil clods in the plough layer under different ploughing methods was also investigated. The results obtained denoted that the compaction and the proportion of soil clod and fine soil particles influenced the growth of rice markedly.

The effect of soil compaction on the growth of rice was produced by the mechanical resistance of soil to the penetration of roots, the inhibition of nutrient transformation and the unfavorable physical properties of soil moisture. The mineralization of soil nutrients might be mainly affected by soil clodding.

[Continuation of TURANG XUEBAO No 3, Aug 79 pp 265-276]

Grinding the soil in water might promote the release of NH_4-N. The release of NH_4-N was obviously less in clod > 1 cm in diameter. Therefore, it is suggested that the quantity of soil clod < 1 cm in diameter in the plough layer may be taken as an important index for the evaluation of spring ploughing.

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WANG Renzhen [3076 0088 4176]

ORG: Both of Nanjing Institute of Soil Science, Chinese Academy of Sciences

TITLE: "The Moisture Retention of Several Important Soils in China"

SOURCE: Beijing TURANG XUEBAO [ACTA PEDOLOGICAL SINICA] in Chinese No 3, Aug 79 pp 277-281

TEXT OF ENGLISH ABSTRACT: The moisture retention of several important soils in China have been measured with the pressure membrane apparatus. These soils are the laterite, the red soil(parent material), the loess, the purple soil and the light meadow soil of different textures, namely sandy loam, light loam and medium loam. The results obtained showed that the finer the soil texture, the higher the soil moisture capacity is in a higher soil suction range; whereas in the lower soil suction range, the moisture capacity might not be related to soil texture. The field capacity and wilting percentage of the light meadow soils with the three textures mentioned above in North China Plain were compared with those of the same soils under the soil suction of 0.1-0.3 and 15 bars respectively. Results showed that the wilting percentage of all these soils of the three textures approximated to that under the soil suction of 15 bars. The soil moisture retention and the availability of soil moisture under different

[Continuation of TURANG XUEBAO No 3, Aug 79 pp 277-281]

soil suction are discussed with the concept of specific water capacity. It is indicated that specific water capacity was decreased rapidly with the increase of soil suction, i.e., the water released from soil to the plant would rapidly decrease. Thus, the availibility of soil moisture would decrease too. The calculated results showed that the specific water capacity of soil under soil suction of 10-15 bars was about 100 times less than that under soil suction of 0.1-0.3 bars.

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TITLE: "Investigation on the Mobilization of Phosphorus from Rock Phosphate by Powdered Coals and Peats"

SOURCE: Beijing TURANG XUEBAO [ACTA PEDOLOGICAL SINICA] in Chinese No 3, Aug 79 pp 282-290

TEXT OF ENGLISH ABSTRACT: Highly weathered coal debris and peats were pulverized into fine powders. They contain humic acid ranging from 30-50 percent. Effects of the rate of mobilizing phosphorus from rock phosphate powders by these humified materials were studied in incubated culture, pot experiments and field experiments. Results obtained are described.

Thanks are due Wen Qixiao [2429 0796 1321] for revising the draft.

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TITLE: "Water and Salt Regime of Paddy Soils in the Depression Along the Yellow River at Fengqiu, Honan"

SOURCE: Beijing TURANG XUEBAO [ACTA PEDOLOGICAL SINICA] in Chinese No 3, Aug 79 pp 291-301

TEXT OF ENGLISH ABSTRACT: Investigation and field experiment on the water and salt regime of paddy soils were carried out in the depression area along the Yellow River in Fengqiu county, Honan Province. The results obtained are as follows:

1. Because of the light texture of the soils from sandy loam to loam, salt injury was resulted from the high capillary conductivity of soil water and the readily accumulation of salts in the surface soil, even under the condition of low concentration of ground water. The submerged water in rice field could

[Continuation of TURANG XUEBAO No 3, Aug 79 pp 291-301]

wash the salt downward, and was also conducive to the desalination of the ground water.

2. Secondary salination of the soils around the rice field was caused mainly by the rise of ground-water level due to the irrigation of the rice field. The outward spreading of secondary salination of soils was induced by the high ground-water level of this adjacent area as compared with that of outer area, i.e., by the occurrence of a hydraulic potential gradient in the surrounding soils of rice field. The water and salts in soil moved from the place adjacent to the rice field with higher hydraulic potential to places far from the rice field with lower hydraulic potential, and were accumulated there.

3. As a result of the poor drainage of the soils in depression, the ground-water level was high, and it was quite easy for light soils to be resalinized when the rice field was changed for dry farming. After diverting the river water for warping, a clay layer was usually deposited o.er the soil surface. It was shown that the clay layer had a favorable effect on the inhibition of soil salinization, and the thicker the clay layer, the lower the rate of salinization.

4. Irrigation and drainage systems were the important factors of controlling the water and salt movement in paddy soils. The drainage system in the depression

[Continuation of TURANG XUEBAO No 3, Aug 79 pp 291-301]

was composed of temporary sublateral ditches, field canals and branch canals. The sublateral and field drainage canals might regulate the water regime when combined with the irrigation canals, but played a minor role in the desalination of soil. The branch drainage canals were conducive to the desalination of soil and the lowering of ground-water level, and thus were beneficial to the melioration of saline soils. Therefore, the depth of the branch drainage canals should be not too shallow and interval between two canals not too wide. At the juncture of the rice field and the dry farmingn land, a deep and unobstructed drainage canals should be dug so as to cut off the water-flow coming from the rice soil and to prevent the salinization of soils.

5. It is recommended that several points should be considered for the rice cultivation in the depression along the Yellow River: (a) The area used for rice plantation should be decided according to the local conditions of irrigation and drainage. (b) In the irrigation-drainage system, canals should be accompanied by wells. The well water can supplement the river water, and the well also serves for the drainage of soil water. (c) It is necessary to combine the rice cultivation with warping, and to warp in the upper course and to cultivate rice in the lower course of the river. (d) Rice field should be reasonably arranged so as to minimize its unfavorable effect on the dry farming land adjacent to it.

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ORG: ZHAO of Institute of Low Temperature, Heilongjiang Province, ZHAO of Institute of Water Conservancy, Heilongjiang Province

TITLE: "Studies on the Annual Change of Soil Moisture in the Plain of the Songhua River and the Nen River"

SOURCE: Beijing TURANG XUEBAO [ACTA PEDOLOGICAL SINICA] in Chinese No 3, Aug 79 pp 302-305

TEXT OF ENGLISH ABSTRACT: This paper deals with the regularity of annual change of soil moisture in the plain of the Songhua River and the Nen River. The conclusions are as follows:

1. The characteristics of the soil moisture change in the seasonal frozen region are: In the winter, in the area of high ground water table, large quantity of water is transported from the ground water to the frozen layer. In the spring, following the thawing of frozen layer, a water layer lying over the frozen layer is formed and becomes main source of the soil moisture. This process, therefore, deeply influences pedogenesis.

[Continuation of TURANG XUEBAO No 3 Aug 79 pp 302-305]

2. The soil water lying over the seasonal frozen layer is, in fact, ground water in the surface soil. The underlying frozen layer is impermeable. The soil water is supplied continuously by melting snow, rainfall, irrigation water and water from the thawing frozen layer; it is lost through horizontal run off and evapotranspiration.

3. In the rainy spring, the presence of the seasonal frozen layer is one of the main factor of waterlogging. The salt accumulation in soil is related with the high concentration of salts in the soil water lying over the frozen layer which is near the ground surface. It has no concern with the ground water.

AUTHORS: LUO Jiaxian [5012 1367 6353]
JIANG Meiyin [5592 2734 5419]
YANG Deyong [2799 1795 8673]

ORG: Nanjing Institute of Soil Science, Chinese Academy of Sciences

TITLE: "Physico-Chemical Properties of Several Bentonites"

SOURCE: Beijing TURANG XUEBAO [ACTA PEDOLOGICAL SINICA] in Chinese No 3, Aug 79 pp 306-312

TEXT OF ENGLISH ABSTRACT: The physico-chemical properties of four samples of bentonite collected from Jiutai in Jilin Province, Changwei in Shandong Province and Nanjing in Jiangsu Province were studied. X-ray diffraction and chemical analysis of these samples were made and their particle size distribution, viscosity and cation exchange capacity were determined. Results obtained showed that all these bentonites were Ca-Mg clays. The sample collected from Nanjing had a higher exchange capacity and that from Jiutai contained more exchangeable sodium.

AUTHORS: DENG Jiahuang [6772 1367 3874]
YU Yuansheng [0151 3293 4141]

ORG: Jiangsu Institute of Geography

TITLE: "Determination of Total Fluorine in Lacustrine Sediments by Ion Selective Electrode "

SOURCE: Beijing TURANG XUEBAO [ACTA PEDOLOGICA SINICA] in Chinese No 3, Aug 79 pp 313-318

TEXT OF ENGLISH ABSTRACT: The determination of total fluorine in lacustrine sediments using a fluorine ion-selective electrode was studied.

The sample was brought into solution by fusion with sodium hydroxide or sodium peroxide and sodium carbonate. It is found that same results were obtained with the two fluxes, but sodium hydroxide was preferable owing to its ready removal from crucible.

The interference of Al, Fe and other metal ions might be eliminated by the addition of mixed solution of complexing agents--CDTA (0.05 M), sodium citrate (1 M) and sodium chloride (1 M). The proportion of the mixed solution to the test solution used in this method was 4 : 6.

[Continuation of TURANG XUEBAO No 3 Aug 79 pp 313-318]

It has been shown that Gran's graphical method is simpler and more accurate than other methods for the calculation of the fluorine content determined by the ion selective electrode.

AUTHOR: YAO Yunfang [1202 5619 5364]

ORG: None

TITLE: "A Look at the Future From the Viewpoint of the Change of the Theory of Movement of Ships"

SOURCE: Beijing JIANCHUAN ZHISHI [KNOWLEDGE OF SHIPS] in Chinese No 1, 20 Feb 80 pp 2-5

ABSTRACT: In the 1970's, futurology has been established as a new science and there are many predictions regarding types of future ships. Some of these have become reality while others remain dreams. The problem of the original displacement boat theory is its low speed and the solution is thought to be having the boat navigate either above or below the water surface. With the objective of lifting the boat above the water surface, Comte de Lambert of France invented the first hydrofoil in 1892. Since then, many types of boats operating in nonconventional manners have been created. Theories and developments of hydrofoils, static air-cushion boats, dynamic air-cushion boats, air-propelled boats, and semi-submerged boats are briefly explained. The advantages and shortcomings of these new types of boats are discussed. Combinations of these designs to compliment one another are thought to be the trend of future development.

AUTHOR: QIU Zhi [3061 4249]

ORG: None

TITLE: "High-speed Ferries in the English Channel"

SOURCE: Beijing JIANCHUAN ZHISHI [KNOWLEDGE OF SHIPS] in Chinese No 1, 20 Feb 80 p 5

ABSTRACT: The British Hovercraft Corporation is the forerunner of air-cushion boat manufacture. It made the world's first SR.N 1 air-cushion boat in 1958. Ten years later, it made the SR.N 4 with a displacement of 180 tons and a speed of 70 knots ferrying between England and France in the English Channel. After reconstruction in 1972, its displacement was increased to 200 tons. Its second reconstruction was completed in Apr 78 to enable it to carry 416 passengers instead of the original 254, and 60 cars instead of the original 30. The displacement was raised to 300 tons, but the speed remained 70 knots. At present, 5 SR.N 4 air-cushion boats are operating in the English Channel, carrying one fourth of the passenger-automobile traffic of that route. The paper includes a brief discription of the improvements made to that type of hovercraft in 1978.

AUTHOR: BI Shiguan [3968 1102 0385]
TANG Zhongfan [0781 6988 5672]
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ORG: None

TITLE: "Heart of the Guided Missile--the Guided Missile Engine"

SOURCE: Beijing JIANCHUAN ZHISHI [KNOWLEDGE OF SHIPS] in Chinese No 1, 20 Feb 80 pp 8-10

ABSTRACT: Since the 1950's, with the development of guided missile technology, guided missile launchers have replaced the original major weapons of guns and torpedoes as the chief equipment of warships. A guided missile is a self-propelled vehicle, with or without a warhead. It is designed to move in a trajectory or flight path all or partially above the earth's surface. It is different from drones, torpedoes, and rockets in that it is capable of being directed by remote control while in flight. Types of engines used in guided missiles include the solid rocket engine, the liquid rocket engine, the jet propulsion engine, the turbojet engine. This paper gives a brief description of each of these types in separate sections. Drawings are given to depict the structure of these engines.

AUTHOR: CHEN Liwen [7115 4539 4489]
Dong Fanglin [5576 2455 2651]

ORG: None

TITLE: "Mooring Line Rocket"

SOURCE: Beijing JIANCHUAN ZHISHI [KNOWLEDGE OF SHIPS] in Chinese No 1, 20 Feb 80 p 10

ABSTRACT: In the past, in order to bring a boat to shore, a sailor must first throw the mooring line, a rope or a chain with a metal ball attached to the end, manually to the shore for someone on the pier or wharf to fasten it onto the bollard. The mooring line is then used by persons on the boat and on the shore to maneuver the boat closer and closer to shore. The same maneuvering is needed to bring two boats next to one another. The distance for a mooring line to be thrown manually is limited and the procedure is difficult to accomplish especially during storms. With the help of related organizations, the rear support department of South Sea Fleet successfully made a line-throwing rocket, capable of throwing the mooring line 10 time farther than the manual distance. This rocket is especially useful to supply or rescue distressed ships at sea during a storm. A photo depicting such a rocket in flight is included in the paper.

AUTHOR: LIU Shan [0491 9152]

ORG: None

TITLE: "A Fourteen Hundred Thousand Ton Oil Tank Suddenly Exploded"

SOURCE: Beijing JIANCHUAN ZHISHI [KNOWLEDGE OF SHIPS] in Chinese No 1, 20 Feb 80 p 11

ABSTRACT: This paper tells the explosion of the oil tanker Betelgeuse of French registration in a Gulf Oil terminal at Bantry, Irland on 8 Jan 79. Forty-two employees on board died in the accident. According to the paper, half of the crude oil had been unloaded and the first mate was on the bridge. He pushed a button to order the automatic control center to start cleaning an empty oil compartment and an explosion followed, blowing up the entire tanker. The heavy oil pump on the deck is said to have caused a crack of the steel plate producing sparks. The exhaust valve of one of the compartment was frozen by the cold weather to cause the flammable gasses of the left over petroleum and the 6-16 percent oxygen to be trapped in the compartment. The few sparks from the crack of the steel plate were all that were needed to ignite the gasses. As the Betelgeuse was built in 1968, and did not have the inert gas safety feature. The story is told here for the purpose of proving that the automatic monitoring system on board ships is very unsatisfactory, and, according to the Norway Committee, a much stricter regulation is needed.

AUTHOR: GU Jiqing [7357 4764 3237]

ORG: None

TITLE: "Discussing Tubes of a Speedboat in Terms of a Story of a Naval Battle"

SOURCE: Beijing JIANCHUAN ZHISHI [KNOWLEDGE OF SHIPS] in Chinese No 1, 20 Feb 80 pp 12-13

ABSTRACT: The paper begins with the story of an unspecific battle at sea. The radar indicated to the group of 3 speedboats that they were approaching a ship of unknown origin and the captain ordered full speed ahead. The target grew closer and a battle was imminent. Suddenly there was a noise in the engine room. The rubber hose of the fresh-water cooling system slipped off. Boiling hot water gushed out and the engine had to be stopped. The battle never did go off. The author tells the story for the purpose of explaining the importance of tubes on a speedboat. He divides the tubes into 5 groups: the fuel tubes, the lubricant tubes, the exhaust tubes, the starter air tubes, and the cooling tubes. There is a diagram depicting the cooling system of the diesel engine. A short discussion of each of the 5 groups is also included, but the emphasis is on the fresh-water cooling system.

AUTHOR: FU Qifang [0265 0366 9443]

ORG: None

TITLE: "Function of the Anchor"

SOURCE: Beijing JIANCHUAN ZHISHI [KNOWLEDGE OF SHIPS] in Chinese No 1, 20 Feb 80 p 16

ABSTRACT: The rudder and the anchor are commonly said to be the two magic instruments of the captain. The anchor is also used as the symbol of navigation. The functions of the anchor are described in the paper to include (1) to moor the boat; (2) to brake the boat in an emergency; (3) to facilitate turning in narrow channels; (4) to help the boat to moor or to leave the pier. The anchor also help some engineering boats to locate a position, etc.

AUTHOR: LI Jiu [4539 0036]

ORG: None

TITLE: "New Life in Pleasure Boating -- the Appearance of the T195C Diesel Engine"

SOURCE: Beijing JIANCHUAN ZHISHI [KNOWLEDGE OF SHIPS] in Chinese No 1, 20 Feb 80 p 16

ABSTRACT: China has many scenic waters and small motorboats are the ideal vehicles to be used for touring these streams and lakes. For the purpose of meeting the needs of the rapidly expanding tourist industry, the South China College of Engineering and the Guangdong Xijiang Machine Plant jointly designed and made a small diesel engine for boats, the T195C, which is a 10 horsepower single cylinder engine. Although it is designed to be used on small inland or coastal sailing vessels, it can also form the power source for small agricultural machines.

AUTHOR: CHEN Tianshou [7115 1131 1108]

ORG: None

TITLE: "How Does a Gyrocompass Point to the North?"

SOURCE: Beijing JIANCHUAN ZHISHI [KNOWLEDGE OF SHIPS] in Chinese No 1, 20 Feb 80 p 17

ABSTRACT: In ancient times, a ship sailing in the ocean depended upon the simple compass to point out the directions. The modern gyroscopic compass is a more precise north-seeking instrument. This paper explains the structure of a gyroscopic compass and its process of self-alignment in azimuth by using the inertial platform's accelerometers to slave it to the local gravity vector, and employing one of the gyros to seek true north by sensing the rotation of the earth. Simple drawings are included to depict the structure of a gyrocompass, the rotation of the earth, and the manner the gyrocompass is made consistently seek the north.

AUTHOR: (1) LIANG Huasheng [2733 5478 3932]
(2) FU Fengbao [0265 0023 1405]
(3) HU Boyang [5170 2672 2254]
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ORG: None

TITLE: "New Birth for Sailboats"

SOURCE: Beijing JIANCHUAN ZHISHI [KNOWLEDGE OF SHIPS] in Chinese No 1, 20 Feb 80 pp 18-19

ABSTRACT: This paper includes 4 short items by the 4 authors under the following headings: (1) Will the ancient sailboats be revived? (2) A new type of 20,000 ton sailboat sailing across the North Atlantic; (3) Cargo ships equipped with sails about to be created; (4) Sailing Vessels. The central idea of these items is that with the energy crisis, modernized vessels with sails are being designed in foreign countries for the purpose of utilizing wind power to save fuel. These new sailboats are equipped with engines and sails are used only when the wind is favorable. The author of the fourth short item predicts that in the next few years, many oil tankers, cargo ships, and passenger ships will navigate the oceans by sails.

AUTHOR: ZHU Jun [2612 6874]

ORG: None

TITLE: "Container Ship--An Explanation for Inside Back Cover"

SOURCE: Beijing JIANCHUAN ZHISHI [KNOWLEDGE OF SHIPS] in Chinese No 1, 20 Feb 80 p 19

ABSTRACT: The inside back cover of this issue contains drawings depicting a container ship and this paper explains that container ship is a cargo ship, carrying its cargo in boxes of standard size called containers. The containers need not be opened before each of them reaches its designated place. The containers can be rapidly loaded and unloaded from the ship. The deck of a container ship is not occupied by cranes and the boxes of uniformed sizes cause the space of the ship's compartments to be much more effectively used. The paper does not mention if China has any container ship at present.

AUTHOR: ZHOU Yuanhe [0719 0337 0735]

ORG: None

TITLE: "Destroyers With Guided Missiles"

SOURCE: Beijing JIANCHUAN ZHISHI [KNOWLEDGE OF SHIPS] in Chinese No 1, 20 Feb 80 pp 20-21

ABSTRACT: In the early 1970's, France began to build destroyers equipped with guided missiles. Three have since been completed and have joined the French navy in 1974, 1975, and 1976 respectively. Aside from the anti-submarine function, these destroyers are also capable of attacking water surface targets and aircrafts, and providing support for landing. The specifications and properties of these destroyers are described. There is a drawing depicting the locations of the sonar, the helicopter, the guided missile launchers, the 100 mm automatic guns, etc. on the destroyer. The photo of one of the 3 destroyers is also given.

AUTHOR: YE Zhi [0673 1807]

ORG: None

TITLE: "Guided Missile Speedboats of the Soviet Union"

SOURCE: Beijing JIANCHUAN ZHISHI [KNOWLEDGE OF SHIPS] in Chinese No 1, 20 Feb 80 pp 22-23

ABSTRACT: The Soviet navy has more than 450 speedboats, and of these more than 120 are equipped with guided missile launchers. There are the Komar [Mosquito Class] built in the 50's, the Osa [Yellow Jack Class] built in the early 60's, and the Nanuchka which began to be built in 1970. The first two types have been supplied to many other countries. Brief descriptions of the different classes of guided missile carrying speedboats, photos, and drawings depicting general structures are given in the paper.

AUTHOR: FU Zhou [3940 5297]

ORG: None

TITLE: "Mol Class Speedboats"

SOURCE: Beijing JIANCHUAN ZHISHI [KNOWLEDGE OF SHIPS] in Chinese No 1, 20 Feb 80 p 23

ABSTRACT: Mol class speedboats are the nickname given to the Soviet speedboats, derived from the Osa class but with no guided missile launchers, by the North Atlantic Treaty Organization. Some speedboats of that class carry 4 533mm torpedo tubes, but others do not; they all have double barrel 30mm guns. The prototype of this class began to be built toward the end of the 50's. Later, other types of speedboats, such as the Stenka and the Turya appeared and the 230-ton Mol class have mainly been produced by the Soviet Union for export purpose.

AUTHOR: ZHANG Boqi [1728 4102 4359]

ORG: None

TITLE: "Bitter Water of Qionghai Turned Into Sweet Spring"

SOURCE: Beijing JIANCHUAN ZHISHI [KNOWLEDGE OF SHIPS] in Chinese No 1, 20 Feb 80 pp 24-25

ABSTRACT: Fresh water supply has always been one of the reasons preventing humans from prolonged staying on board a ship. Sea water contains more than 3.5 percent of salts and is not drinkable. A ship of 10,000-13,000 horsepower steam engines with 50 employees requires about 400-600 tons of fresh water per month and the cargo volume is greatly affected for the amount of fresh water it must carry. This paper describes several distillation instruments suitable for converting sea water into fresh water on board a ship. In recent years, ship designers have been studying techniques of electrodialysis, reverse osmosis, freezing, solar heat, dispersion, chemical treatment, etc. As these techniques have not yet been sufficiently perfected for extension, they are only briefly mentioned in the paper.

AUTHOR: ZHANG Ming [1728 7686]
YANG Guokuan [2799 0948 3883]

ORG: None

TITLE: "An Excursion at the Ding Mansion"

SOURCE: Beijing JIANCHUAN ZHISHI [KNOWLEDGE OF SHIPS] in Chinese No 1, 20 Feb 80 pp 28-29, 32

ABSTRACT: About half an hour of boat ride eastward from Weihai City, originally called Weihaiwei, brings one to the island of Liugong Dao. Four red brick classic style structures built in 1887 as the headquarters of the Commander of the North Sea Fleet of the Qing Dynasty are still imposingly standing on the island. People call it the Ding Mansion after the famous commander DING Ruchang [0002 3067 2490]. During the Sino-Japanese War, Commander Ding disregarded the restraining order of Li Hongzhang [2621 7703 4545] and fought a a courageous battle against the invaders. The naval battles of 1894-95 are briefly reviewed, listing the names of lesser officers who fought and died with the commander.

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